

OCTOBER 1962

35 CENTS

Popular Science

ANNUAL
NEW-CAR
ISSUE

Monthly

'63 CARS IN COLOR

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Pictures
of Detroit's
Toughest
Tests



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1963 CATALOG No. 630

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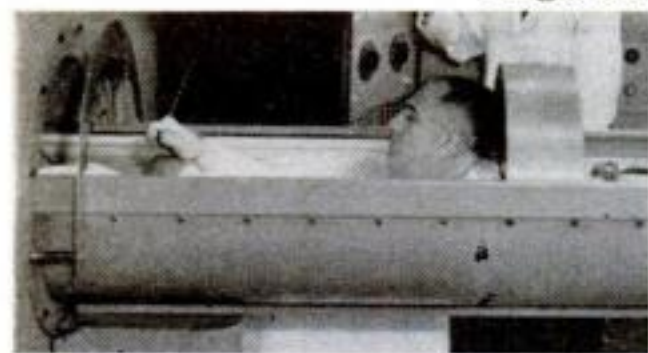


Comet convertible. An entrant
in the big preview parade of the
'63 cars. Starting on page 57.



Chop a hard
oak log in
seconds?
A champ
with an axe
tells you how.
See page 98.

How much of
you is fat?
At Purdue
they have a
device that
can tell lard
from lean.
Page 90.



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THE '63 CARS IN COLOR

How Detroit Factory-Tests Them • 57

... Buick ... Galaxie ... Pontiac ...

Fairlane ... Plymouth ... Mercury ...

Lark ... Chevrolet ... Chrysler ...

Tempest ... Comet ... Dodge ... Olds

INSIDE THE '63 CARS:

FACTS, FIGURES, DRIVING REPORTS

What's Detroit Up To This Year? • 67

What's New in the Chevy Family • 68

What's New at Pontiac • 70

The Buick Story: Glamor • 72

Olds Stretches Lube Periods • 72

The Ford Stable: New 3-Speed Box • 74

Chrysler: 50,000-Mile Guarantee • 76

For Mercury: Zoom! • 77

New Engines: Chevy, Tempest • 78

Little Rambler: 2 Shift Sticks • 80

Studebaker: "Blown" Engines • 80

SPACE AND AVIATION

How the First U.S. Jet Was Born • 84

Wild New Airplanes • 92

Battlefield Rockets for Red GIs • 104

SCIENCE AND INVENTIONS

[Alone with a Panic Button • 90](#)
[Under the Sea in a Saucer • 114](#)

BOATING

[The Right Prop for Your Boat • 128](#)

ELECTRONICS

[More TV Channels for Everyone • 125](#)
[Two Exciting Electronic Kits • 164](#)
[Dial Dimmers Replace Switches • 166](#)

SPECIAL REPORTS

[How to Chop Like a Champ • 98](#)
[Hot Little Honda • 106](#)

HOME AND SHOP

[When Fuses Blow as Motors Start • 120](#)
[One Machinist Tells Another • 134](#)
[Pointers on Good Framing • 137](#)
[Shop-Tested Woodworking Joints • 142](#)
[Restoring an Antique Phonograph • 146](#)
[Dado Accessory for Portable Saw • 150](#)
[The New Weller Saber Saw • 159](#)

PHOTOGRAPHY

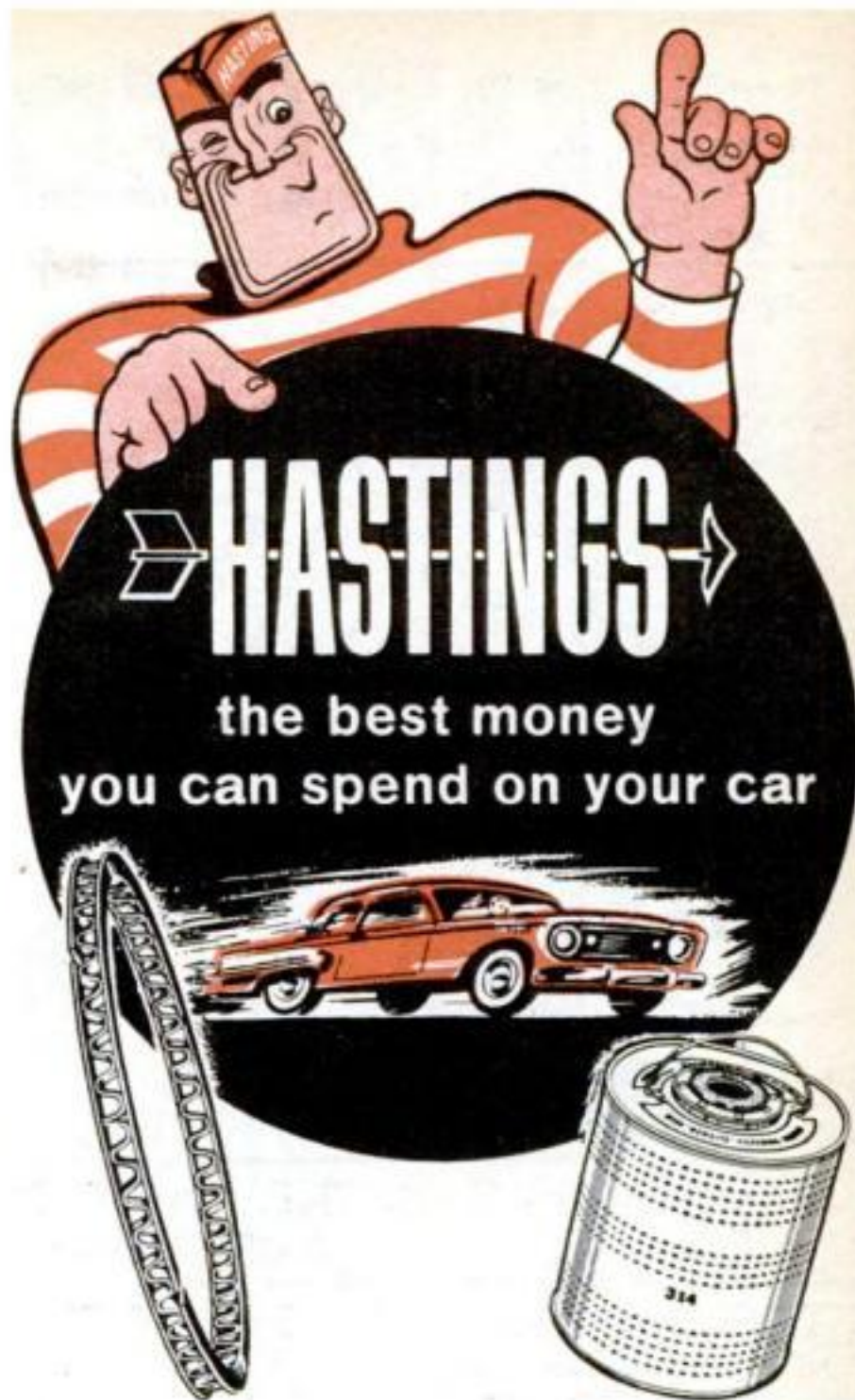
[How to Make a Ring Light • 154](#)
[What's New in Photography • 168](#)

EVERY MONTH

[PS Readers Talk Back • 8](#)
[The March of Science • 21](#)
[Detroit Report • 40](#)
[I'd Like to See Them Make • 89](#)
[New Ideas from the Inventors • 95](#)
[The Other Fellow's Job • 117](#)
[Wordless Workshop • 140](#)
[Shop Talk • 144](#)
[Hints from the Model Garage • 173](#)
[Gus Squeezes a Penny Pincher • 176](#)

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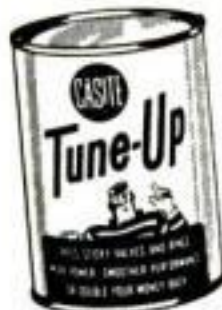
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2 A CAVE-IN PUT ME SIX FEET UNDER FOR SIX LONG MINUTES

QUICK! GET HIM OUT OF THERE!



3 IN THE HOSPITAL, I HAD PLENTY OF TIME TO THINK

SIX YEARS I'VE BEEN BURIED ALIVE IN THAT SAME OLD JOB, JANE!

WELL, NOW'S A GOOD TIME TO DO SOMETHING ABOUT IT



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ONE MONTH LATER...

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I'M READY NOW, MR. WALSH

THEY GAVE ME SOME SIMPLE ASSIGNMENTS... AND I SURE SURPRISED THEM!

SAY, WHERE DID YOU LEARN ABOUT PUMPS?

SAME PLACE YOU DID, JOE... I.C.S.

THEN A FEW DAYS LATER, MR. WALSH CALLED ME IN...

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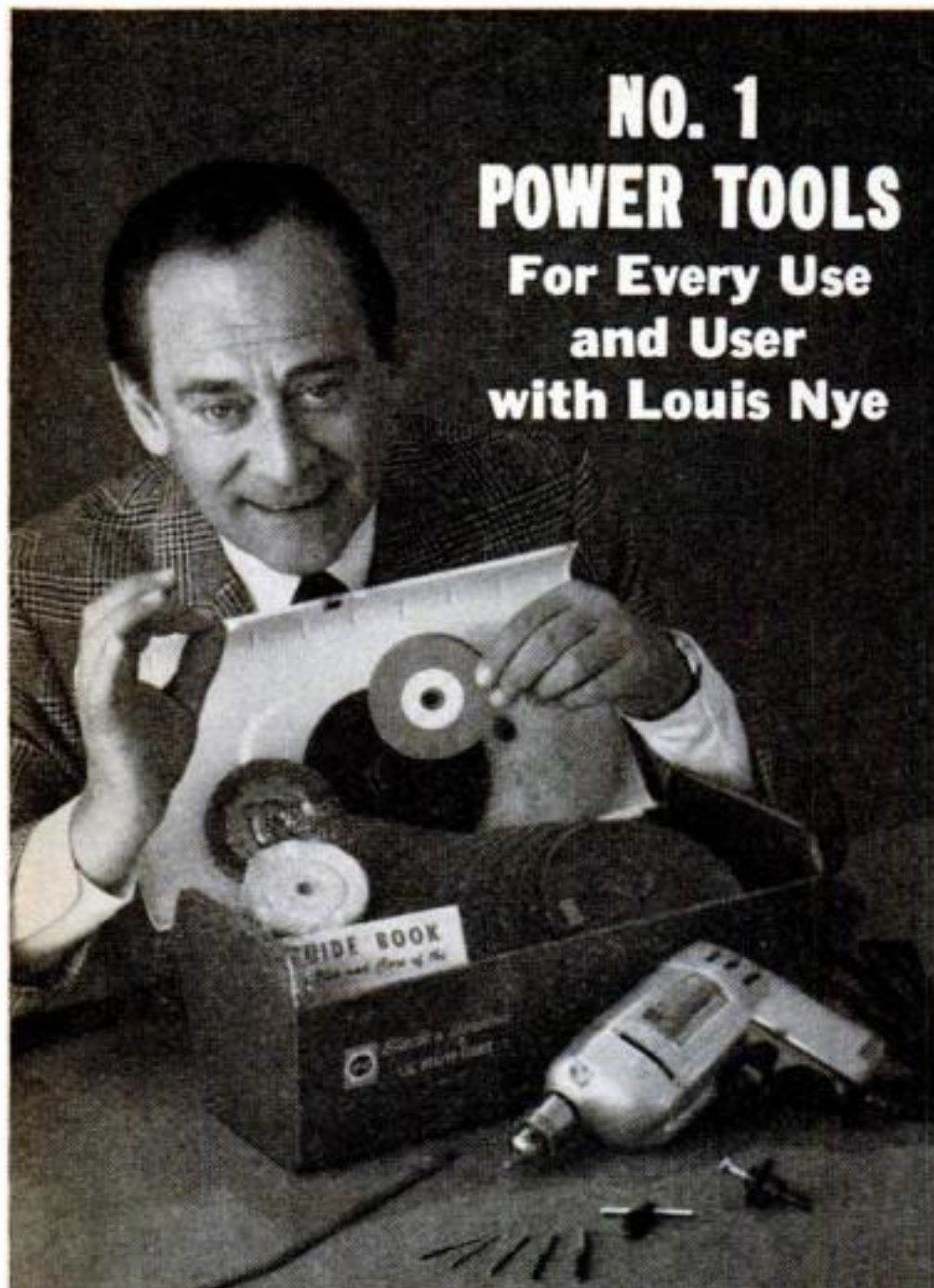
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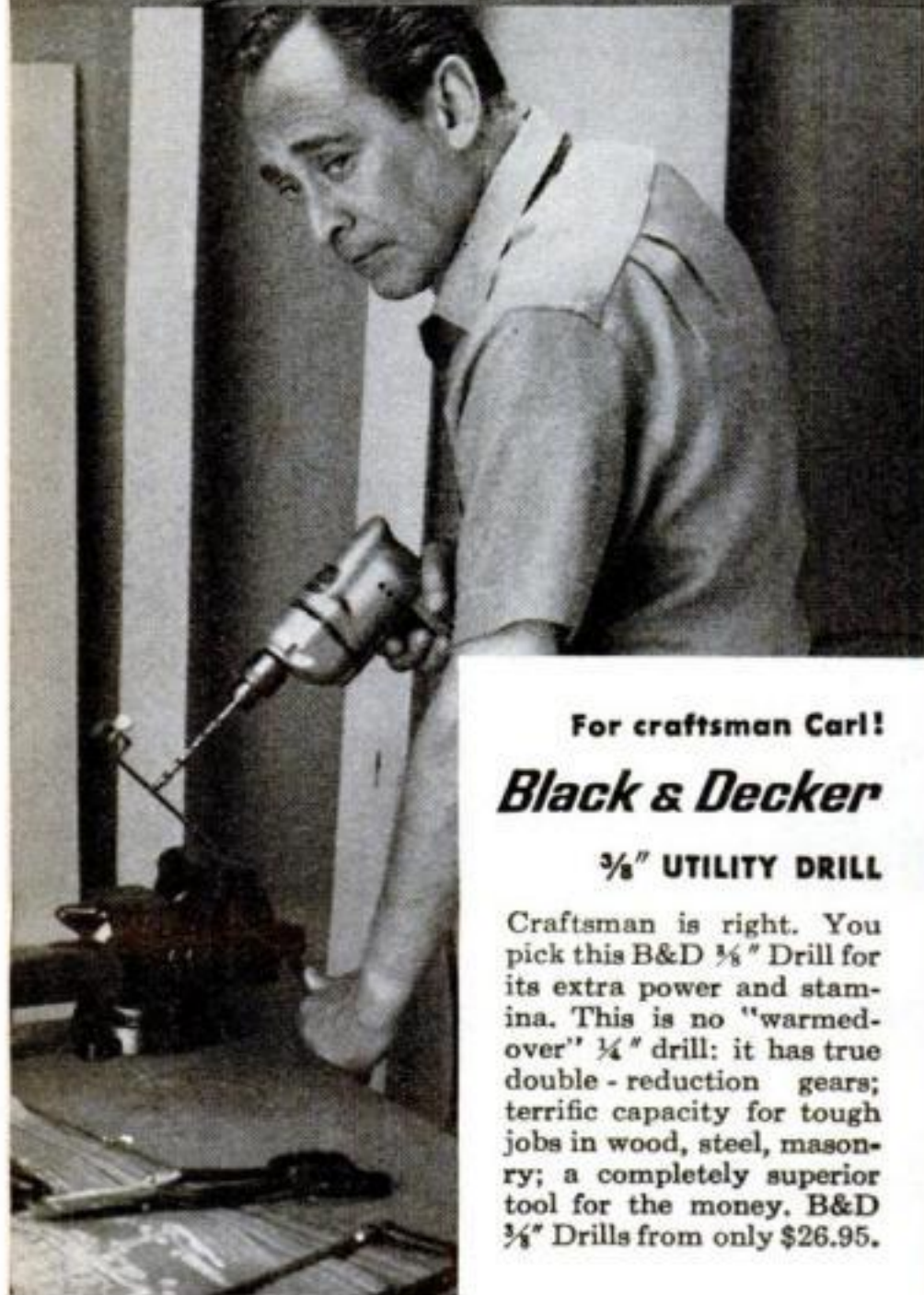
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For Paul Bunyon!
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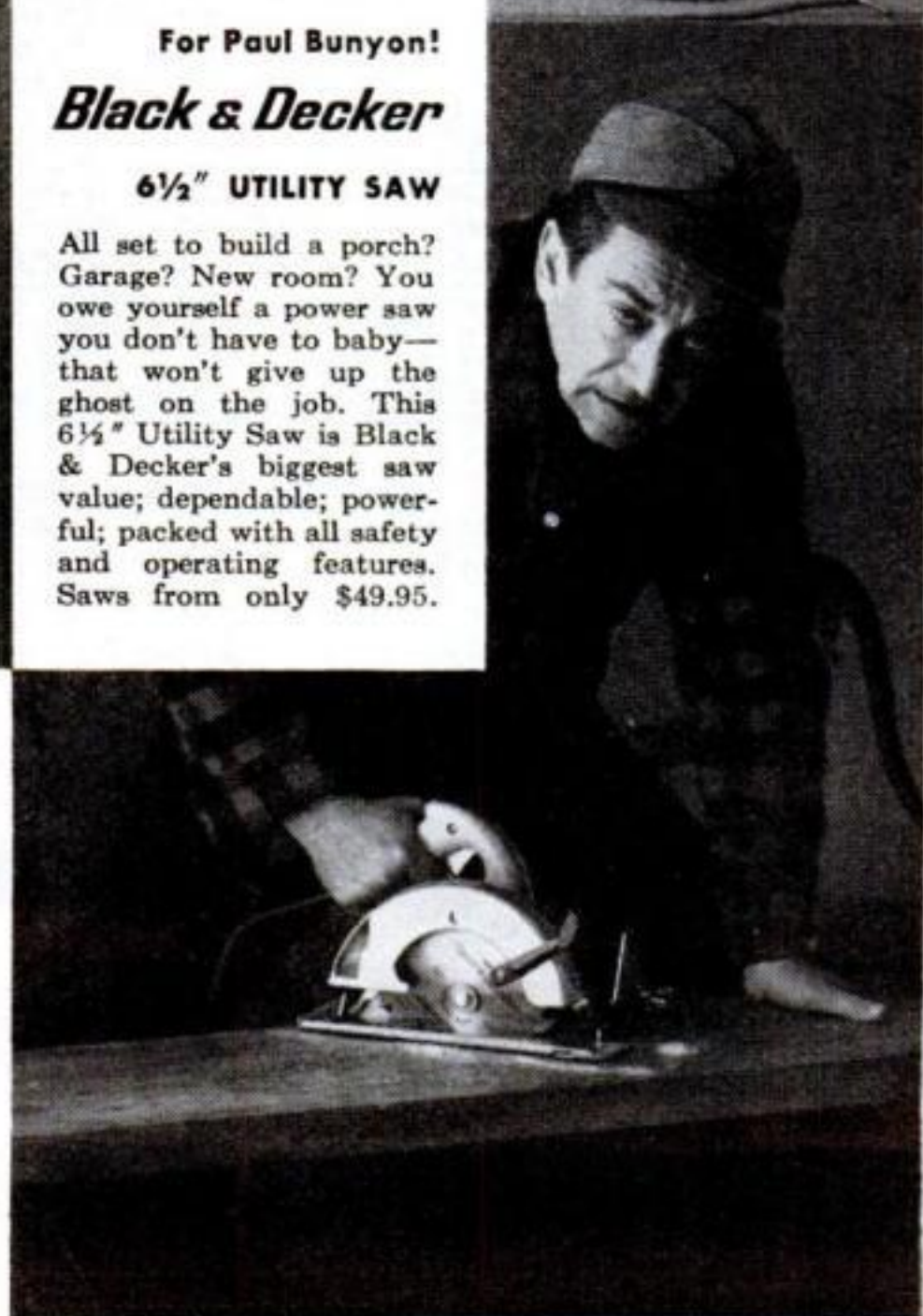
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For husband Harry!

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PS readers talk back



The Navy's Hot Rod

As long as I can remember, your fine magazine has been one of my favorites. I have often enjoyed it without writing to tell you so, but in the case of the splendid article on Enterprise ["85,000-Ton Hot Rod," July, p. 58], I feel I must. It is one of the most interesting and best-presented accounts of one of the vast numbers of complex operations in the Navy that I have seen. You and Mr. Harvey have produced an outstanding article. It will be referred to, I am sure, for years to come, just as we often refer to your magazine for events of the last century.

REAR ADM. E. M. ELLER, USN (RET.)
Director of Naval History
Department of the Navy, Washington, D.C.

... The men at the Navy's Philadelphia shipyard spent a whole summer wiring the four catapults on the Enterprise. Our catapult men and inspectors did a great job insuring safety in both catapulting and arresting planes. We at the Philadelphia Naval Base have worked on nearly all the new carriers, but have never seen our yard or people mentioned.

W. F. WESEMANN, Mantua, N.J.

Signaling the Flashy Driver

Anyone interested in signaling the driver of a car that his turn signal is operating overtime ["PS Readers Talk Back," July, p. 10] needn't do all that electrical wiring. There's an international signal for advising drivers asleep at the switch: the "talking hand."

You hold your hand up and display it to the offending driver while alternately touching and opening the fingers and the thumb.

P. M. GERHARD, Beverly, Mass.

Plenty of Water in Space

Dr. Frank J. Hendel plans to recover water consumed by spacemen, plus an extra pound for every seven ["The March of Science," June, p. 24], by mixing wastes into a sludge and burning it. The product: water, carbon dioxide, and nitrogen. What will be his source of oxygen to make carbon dioxide and water?

HAL BAKER, Boise, Idaho.

What do you think those spacemen are breathing?

Telling the World?

I enjoyed "Underground with the Terrible Titan" [July, p. 35], but one thing bothered me when reading it. The U.S. is giving away secret information on her defenses. I have noticed,



too, that the submarine Nautilus can be bought anywhere as a scale model, showing plenty about the real one. An enemy would probably get all this information sooner or later, but why give it to them?

D. K. DICKSON, Columbus, Ohio.

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Not the Way They Heard It

The warning to mind your p's and q's ["Where'd It Come from?" July, p. 166] originated in the English pub, as you say. It was *not*, though, an admonition to the bartender to measure out a full pint or quart when drawing a customer's ale.

When a customer ordered a pint on credit,



he'd ask the bartender to "put it on the slate." As the drink was chalked up on the blackboard, the customer used the phrase so he wasn't cheated and charged for a quart.

J. H. SMITH, Brampton, Ont.

... In the early days of printing, when type was set by hand, the printer had to pick out the letters one by one from a rack and place them in the press. Since the letters were backwards, it was easy for an apprentice to mistake a lower-case p for a q and vice versa. And that's where the admonition to mind your p's and q's came from.

R. D. FERRIS, Middlesex, Vt.

Somebody Losing His Bearings?

Somebody should tell Bob Owendoff ["A New Way to Find Yourself in the Woods," July, p. 50] that his method of finding true north is far from new. He'll find it on page 43 of the *Boy Scout Field Book*, copyrighted by the Boy Scouts of America in 1948.

MIKE JAMES, Indianapolis.

... So the Army is about to adopt a new method of finding direction? Look up the Army training manual FM 21-76, entitled *Survival*, and dated 1957. It's available from the U.S. Government Printing Office for \$1. On page 174, a method is described for finding direction which I think is substantially the same as Owendoff's.

C. P. FISCHER, Collinsville, Ill.

... A simpler way to find a bearing is to use your watch as described in *Your Own Book of Campcraft* by C. T. Hammett:

You hold your own watch level in the sun and hold a twig or grass blade over the center point so a shadow falls on the face. Then you slowly turn the watch until the shadow falls over the hour hand. Halfway between the shadowed hour hand and the 12 on the watch face (going around the watch the shortest way)

CONTINUED

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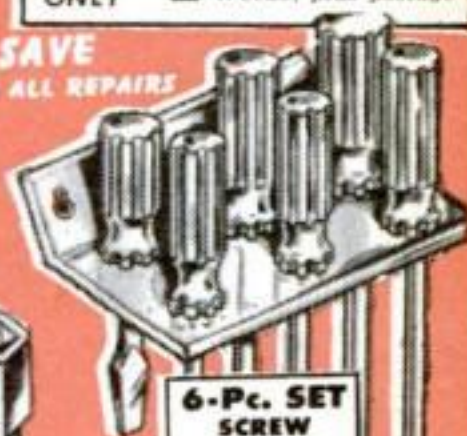
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is true north. The shortest way around varies—one way if it's a.m., the other way if it's p.m.
JIM BROWNLOW, Lancaster, Calif.

... I like a simple way to get my bearings: Hold your watch so that the hour hand points at the sun (standard time, of course); halfway between the hour hand and 12 o'clock is south. I've used this method many times.

O. M. TORGERSON, Wheaton, Minn.

And if you haven't got a watch?

Search for an Old Machinist

I've purchased an old lathe made by Lodge, Davis. It's an 18-inch swing lathe with the threading screw in between the ways of the bed. The half-nut and operating-rod mechanism is missing. Unfortunately, the manufacturer destroyed all parts, blueprints, and other data on this lathe many years ago. Maybe one of your older readers could help me.

If any machinist acquainted with, or owning, this model lathe—I suppose it's an 8-T—would send me a drawing so I could make this half-nut mechanism, it would be greatly appreciated.

R. A. RASNER, Fairfield, Ohio.

Strange Culinary Art

Just read "The Other Fellow's Job" [July, p. 90]. With carelessness rampant these days,

our friend the cake-and-steak man does his bit—by adding cigar ashes to his cooking. Good



appetite, pal; but I'll continue to take mine plain.

F. F. KNAUER, Bellerose, N.Y.

Killing Them Off with Statistics

I'm surprised you find it difficult to understand the "strange fact" that where automobile death rates are high, the injury rates are low ["Cars Kill in the West and South," July, p. 17]. It's simple.

Assume a base of 100 people involved in accidents: In state A, 80 or 100 are injured, leaving only 20 to be killed—a low death rate. For state B, we reverse the figures—if 80 die, then the injury rate must be low; 20 out of 100, in fact.

As for why particular rates occur in particular areas, just glance at the map. High death

CONTINUED



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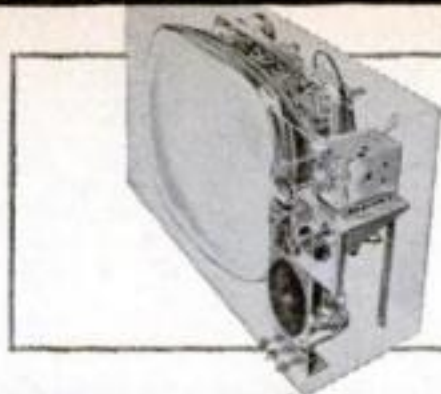
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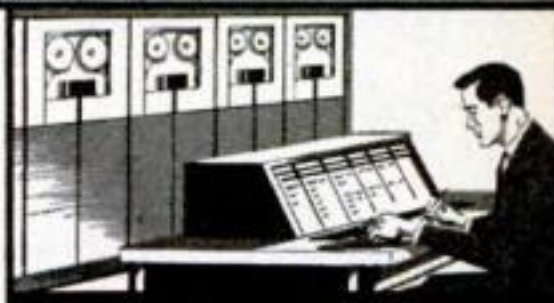


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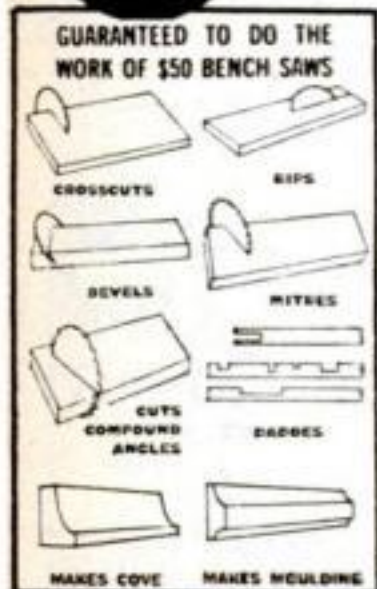
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rates occur in states with wide-open spaces and much high-speed driving. In crowded, urban states, much driving is slow and in heavy traffic. Hence, fewer accidents at such high speeds as to cause death.

JIM KLECKNER, Great Neck, N.Y.

Cleaning a Plastic Pool

Just read about how to clean out a plastic pool with siphon action ["Short Cuts and Tips," July, p. 120].

The writer says to turn on the water until the hose stops spitting bubbles, shut it off, and disconnect the hose. Unless he disconnects the hose *before* shutting off the water, he'll be in trouble. Some water—and sediment—will siphon back into his household water supply.

MIKE BRANDENBURG, Mason, Ohio.



The 100,000-Mile Club

Thanks to Marx ["I Say It Pays to Run a Car 100,000 Miles," July, p. 82], I find I'm not the only oddball in the country.

Upkeep on my '51 Plymouth has cost me far less than depreciation on a new car over a couple of years. Repairs: a couple of pairs of brake shoes, a couple of mufflers, batteries, and tires. I need a quart of oil after 500-600 miles, but there's very little sign of burning oil from the exhaust.

D. C. MARSHALL, Manhattan, Kans.

. . . Our '54 Chevrolet—150 series (2-door)—has 106,220 miles on it. Although we don't keep as complete records as Mr. Marx, there have been no major repairs on the motor. Our upkeep is cheaper, too. Oil is bought by the case (\$3.50 cheaper than buying by the can).

At 80,000 miles, we put in new front shock absorbers. A repaint job (excluding roof) cost us \$70.

My brother just traded in a 1960 car with only 25,000 miles on it. The dealer said it needed a motor overhaul.

G. FIDLER, Reading, Pa.

. . . Let's have some stories on the second 100,000 miles. My old Ford is well on its way, still running 2,000 miles without additional oil and doing better than 20 m.p.g. with the same old engine and parts that it came with. The only trouble we have is holding it down to the 65 speed limit. It wants to cruise at 70. I don't keep records on it.

ERNEST L. MINEAR, Woodland, Calif.

Crossing a Flooded Street

That idea about loosening the fan belt to prevent engine wet-out ["Hints from the Model

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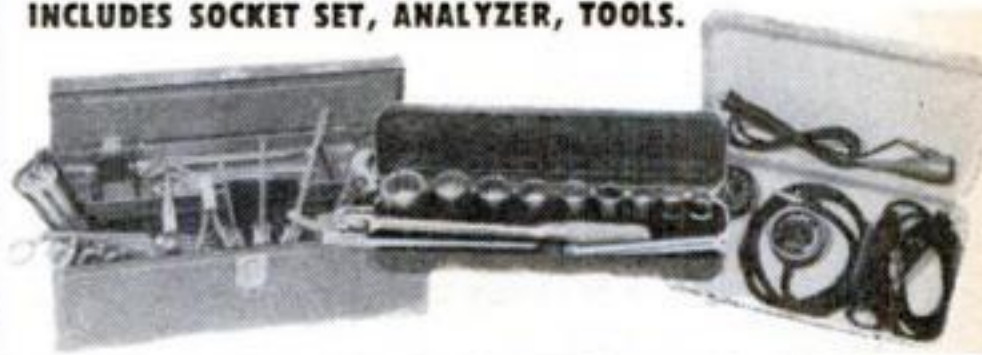
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Garage," July, p. 163] sounds good except for one thing. Loosening the fan belt will stop the water pump and the engine may soon overheat.

W. S. A. QUIRK, Cleveland.

How far are you going?

... I used your method of fording a flooded roadway all the time when crossing arroyos under water here on the Navajo reservation. Then I found an easier way. I wrap the front grille and hood, and underneath up to the front wheels, with a piece of canvas. It's faster than loosening the fan belt and it works fine.

KEN DOUTHITT, Ganado, Ariz.

So Old It's New

In July ["What's Coming in the 1963 Cars," p. 47] you estimated that next year the automobile industry would build more than 1,000,-



000 cars equipped with bucket seats. So what's new? Here is a picture of our 1905-model Buick equipped with bucket seats. We even built some 1904 models with them.

Buick reintroduced the bucket seat in 1960, starting the current trend.

G. H. RIDEOUT

Buick Motor Division, Flint, Mich.

Plea for the Bald Eagle

After reading "Last Chance to Save the Bald Eagle" [July, p. 99], I wondered what Americans were coming to. Despite the things said about his character, most people love and respect this great bird—symbol of strength. If Americans continue to kill off the Bald Eagle, our national symbol will stand for something extinct!

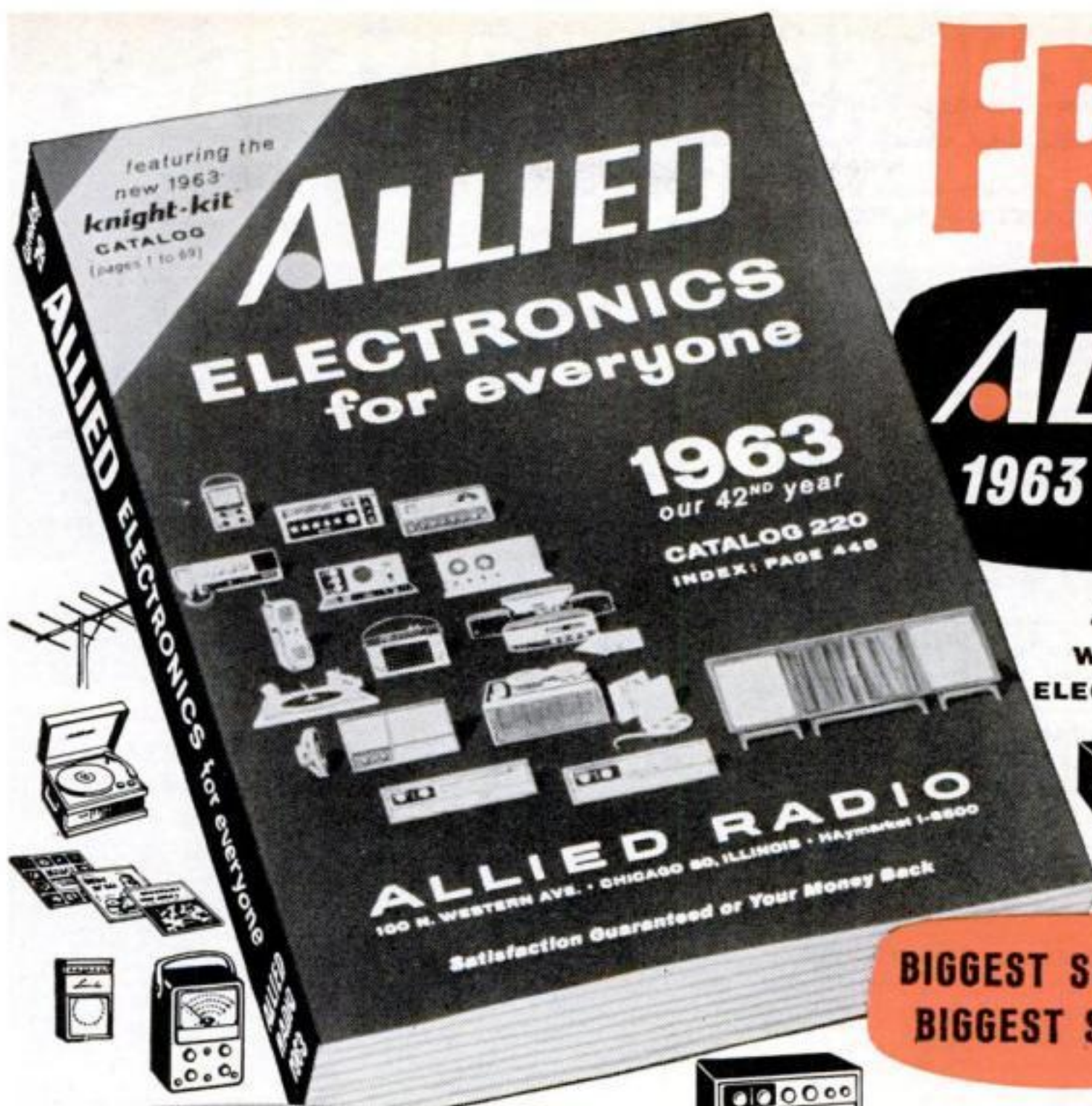
PAT DREW, Waukegan, Ill.

Habit Weaves a Web

Recently I installed seat belts in both our cars. The next few weeks were spent in vocalizing about the buckling habit.

The other day I went out to open the garage door for my wife, as I usually do, so she could put her car away. Without thought, she got in, buckled her belt, and drove the precarious 16 feet past my smiling countenance!

ART MYATTWAY, Long Beach, Calif.



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The march of SCIENCE

By Martin Mann

Everlasting tires—from the wild element fluorine

Some day your new car may come with tires fastened permanently to the wheels. They would never wear out, so there'd be no need to allow for replacement. This is only one of the exciting promises of a new process for making synthetics based on fluorine, the element that is so viciously corrosive as a free gas that it can't even be stored in glass containers. Among the

other prospects: clothes that won't burn, paints impervious to almost everything, tougher metal alloys, dazzling dyes, superior anesthetics and drugs.

PS West Coast Editor Wesley Griswold checked out the story on a swing through Europe and the Near East. At Birmingham University in England, Prof. Maurice Stacey—the rose-growing chemist who pioneered the Dextran blood-plasma substitute—told him:

"My colleagues and I have found a convenient way to make aromatic fluorocarbons—that is, fluorine-carbon compounds with ring-shaped molecules. The oth-

er kind of fluorocarbons—aliphatic, with long chain molecules—are already very valuable for dry bearings (Teflon) and refrigerants (Freon). With aromatic fluorocarbon we multiply enormously the possibilities for creating new synthetic materials. Many of them may have properties that simply weren't obtainable before.

"Fluorocarbons are so useful," explained Professor Stacey, "because they are exceptionally noninflammable. They resist heat, grease, water, and solvents. It takes so much energy to *make* a fluorocarbon in the first place that it forms a very strong bond, extremely difficult to break down. Our new compounds will already stand temperatures of 570 to 750 degrees. We aim to get the temperatures still higher when the compounds are combined with metals. That should make them useful in rockets and high-speed aircraft."

The British government, which backed the work of the Stacey team, is now financing a pilot plant at the University to turn out aromatic fluorocarbons in pound lots. Commercial production is still in the future.



Prof. Maurice Stacey (right) consults with his assistant, Prof. John C. Tatlow, in their Birmingham (England) University laboratory.

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The March of Science . . . continued

Wet blanket to shield moon men

Flares on the sun, which send bursts of deadly atomic fragments (protons) through space, are one of the most worrisome hazards facing the men who will fly to the moon. These bursts are so powerful that completely shielding the cabin against them would add nearly two tons to the Apollo spaceship; it would never get off the ground. The present plan is to duck the danger by scheduling the moon flight between solar flares (they can be forecast fairly accurately). Now, however, Dr. George R. Arthur of GE figures that personal shielding around each of the three astronauts might work. He suggests collapsible armor of aluminum, plastic, and a water blanket. It would add only 1,200 pounds to the load to be blasted off.

Automation in Russia

For years touring American engineers have come home sneering at Russian industry. Except for a show-place ball-bearing plant in Moscow and a few other factories, there are few of the high-speed, mass-production assembly lines that make Detroit a synonym for modern machine civilization. Most Soviet hard goods still come from job shops: The machines can turn out a variety of products, but can't make any one product fast or economically. The idea that the Soviet Union will bury us by outproducing us brings smiles.

Now Prof. John E. Gibson, automation expert at Purdue, thinks the laugh may be on us. He reports that the Russians have no intention of catching up with us; they expect to jump right over. They plan to go from their primitive job shops directly to the newest and most efficient type of automatic factories based on what engineers call "closed-loop control"—and skip entirely the Detroit assembly-line stage.

Most American factories, even automated ones, use open-loop control. A

CONTINUED



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machine is designed to do a specific job; an operator stands by watching the dials. If the dials indicate that the machine is not performing the job exactly right, the operator pushes buttons or turns knobs to correct it. This scheme might be compared to an automobile: The accelerator sets the speed, but the driver has to work the accelerator.

A few cars do have a gadget that automatically moves the accelerator to keep a preset speed; the driver is not involved at all. That's closed-loop control. Industrially, it means machines—even whole factories—that continuously check on what they are doing and *adjust themselves* when necessary.

Closed-loop systems are so accurate and fast they make practical new products and processes that would be impossible under human control. This stage has already been reached in military airplanes. To get very high performance, the aircraft designers have

deliberately accepted instability that only complex automatic pilots can handle. If the black boxes go haywire, the human pilot has to bail out—he simply cannot fly without their assistance.

But this is only the first step. Now coming out of the research labs are “adaptive” control schemes. They do not have to be preset. Only the very general requirements of the job are built into them. They figure out—by themselves—exactly what adjustments to make as the problems come up. In an automobile “cruise control,” an adaptive system would reduce speed for curves or wet pavement, go faster on the straightaways, even obey speed signs.

The U.S. has been slow to adopt closed-loop control (except for oil refining). The Russians, reports Professor Gibson, are going ahead full blast. They are assigning 20,000 engineers and technicians to six institutes that will concentrate on automating industries.

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Owning your own business is easier and much simpler than you have likely thought... when you have the training and the constant aid of a firm that is deeply interested in YOUR success.

You need no previous experience. The business is easy to learn... easy to start... so easy to service that women do it. Dealers operate from home, office or shop. If you can invest a few hundred dollars, we will finance the biggest part of your business.

Each dealer has a personal relationship with our staff. We hold dealer area meetings, training schools, and dealer conventions. We all work together... exchange ideas and swap experiences.

\$9 hourly plus \$6 on Servicemen

The national price guide gives you a gross hourly profit of \$6 on EACH serviceman working for you... \$9 on your own service. One job a day brings a good income. Then, your business grows from recom-

mendations and repeat orders.

You not only steadily increase income... your dealership value grows. G. F. Munroe, after 12 months, sold his Texas dealership for 10 times his cost. Jerry Humbird operated 4 months and sold for \$1,325 above his cost. Jack Braniff started 3 dealerships and sold each at a profit. Leo Lubel, after 30 months, sold for \$8,308 above cost. We help dealers sell, if they wish to.

An experienced Duraclean dealer will train and assist you... reveal his proven ways to build customers. In a few days, your business is established with a growing income.

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You may write to one of our dealers, if you like.

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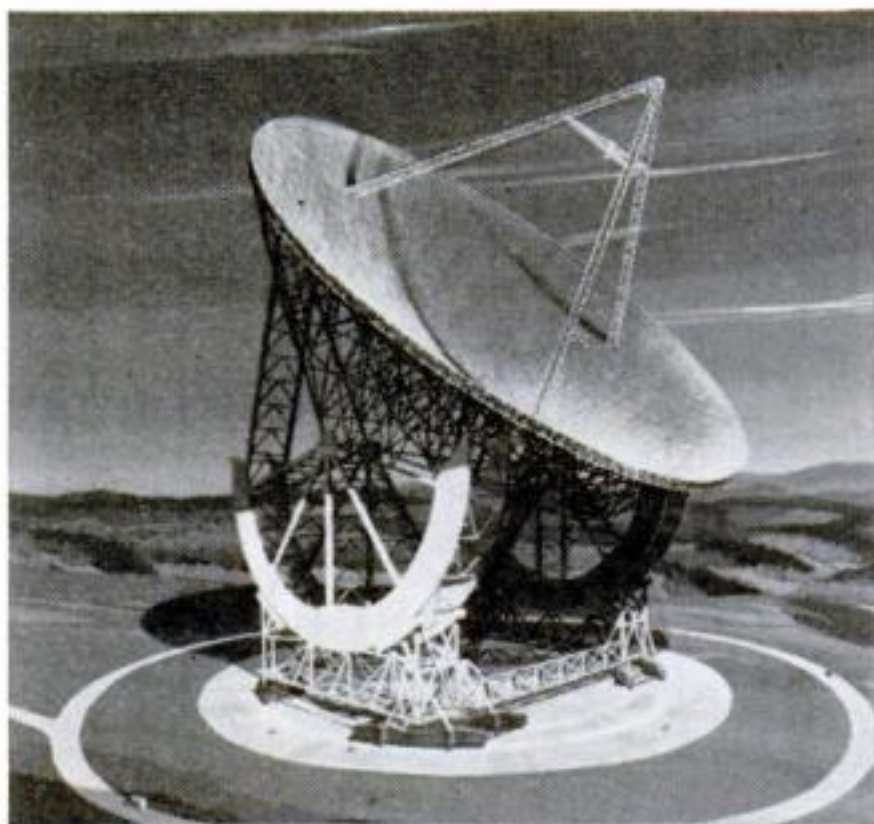
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The March of Science . . . continued

Sad end to world's biggest machine

They lowered the boom last summer on the largest piece of moving machinery men had ever attempted to build [PS Dec. '59, p. 85].

The awesome machine was to have been a gigantic radio telescope—a 600-foot, 20,000-ton metal dish that could turn completely around and tilt through nearly 360 degrees while holding its precisely curved shape against movement, wind, and sun heat. After \$42,000,000 worth of work had been completed (total cost was estimated at \$200,000,000), the Defense Department decided that



the monster instrument would not be needed.

Its intended purpose is still secret. Insiders say the telescope was to eavesdrop on Russian communications, picking up their radio broadcasts as they were reflected back to earth from the moon.

This may seem incredible, but official announcements did say that the big ear was sensitive enough to detect the faint radio signals radiated by stars 38,000,000,000 light years away (the distance in miles would be incomprehensible). Apparently the eavesdropping job can now be done better and cheaper by the spy satellites that are already orbiting the earth.

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The March of Science . . . continued

What sharp teeth you have, Grandma!

"There's diamond dust in them, Little Red Riding Hood."

Grandma might not be kidding. False-tooth jackets and bridgework are being made of fiber-glass plastic impregnated with real diamond dust. According to Diamo-Lust Co. (1661 E. 14th St., Brooklyn, N.Y.), this composition duplicates the brilliance of porcelain but is not so brittle, wears better than acrylic plastic, and is stronger than epoxy plastic.

Coffee doesn't sober up rats

Profs. F. W. Hughes and R. B. Forney of Indiana University got some laboratory rats drunk and then gave them coffee. The rats got drunker yet—"the coffee intensified and prolonged the degeneration of behavior produced by alcohol." This surprising result has still to be checked out on humans.

Hunt for waves of gravity

It is 46 years since Einstein's General Theory of Relativity predicted gravity waves. He said that gravity is a field of force, like electromagnetism, and that oscillations in the field should move through space in the form of waves just as oscillations in an electromagnetic field (radio waves) do. Now Prof. J. Weber of the University of Maryland is taking another crack at finding those predicted gravity waves.

He's building two machines, one to generate gravity waves and one to detect them. The generator is an eight-inch aluminum cylinder six feet long that is vibrated by piezoelectric crystals (the gravity field should vibrate with the object that creates it). The detector is a huge aluminum cylinder—1½ tons—fitted with measuring crystals to gauge vibrations that, presumably, will be induced in the cylinder ends by incoming waves in the gravity field. These crys-

[Continued on page 34]

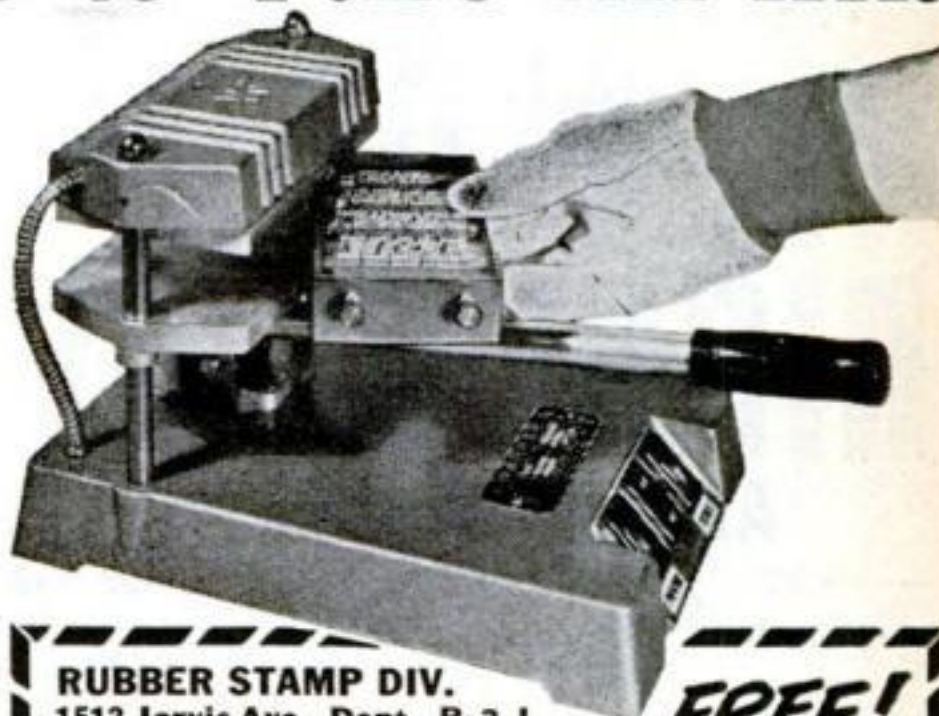
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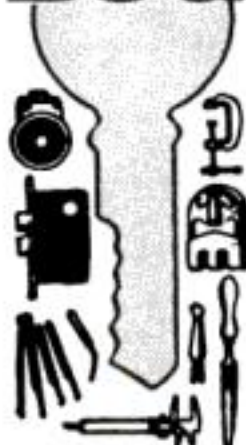
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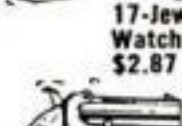
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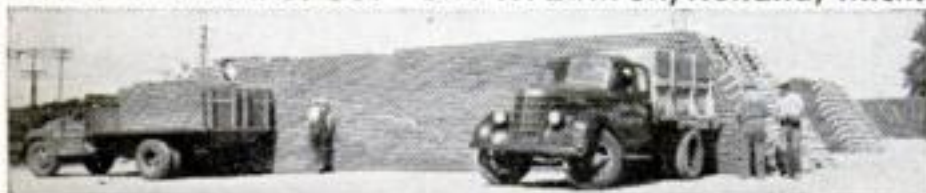
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The March of Science . . . continued

[from page 28]

tals are so delicate they will pick up a movement of less than 40 billionths of a billionth of an inch. The two cylinders are mounted in vacuum chambers (to eliminate air-pressure waves) and on insulators (to eliminate ground vibrations).

Revolt against numbers

The Telephone Company's change-over to long, all-digit numbers (no exchange names) has stirred up a rebellion. Citizens' committees are protesting this ultimate dehumanization. In Los Angeles a man sued to stop the switch. (He's a lawyer who has a tollfree line to attract out-of-town clients; they won't recognize the all-digit number as free, he claims, and he'll lose business.)

In other cities, the change of the "information" number from easy old "411" to long strings of digits has aroused cynical derision. The company claims that this permits splitting up the information service so that an operator can find the number you want more quickly. It turns out that the operator can do her job a few seconds faster—but you have to spend exactly that many more seconds in dialing.

Lengthy numbers without letters are essential if you are to dial directly to any phone in the country without needing an operator. Nationwide dialing will probably prove faster and more convenient for the public. But it seems that transferring work from operators to machinery—and the public—will also prove more profitable for the company.

Bird watchers need chemistry

You can't tell a bird by its feathers, according to Prof. Charles G. Sibley of Cornell. You have to analyze its proteins, which are a surer clue to its family relationships. The professor reports that the new technique shows that falcons do not belong with the other hawks, while turkeys are really large pheasants. ■ ■

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Detroit report

By Devon Francis

Tiny cars are coming

Within five years—maybe sooner—the U.S. automobile industry will begin producing tiny cars, midget-size even compared with today's smaller compacts. This, notwithstanding the fact that Ford shucked plans last spring for producing its little Cardinal here.

The Cardinal was to measure 167 inches bumper to bumper. The American midgets will be lots smaller than that, possibly like the Fiat 600—a hair shy of 130 inches. Other comparisons: Corvair, 180 inches; Falcon, 181.2; Valiant, 186.2; Volkswagen, 160.6.

Both GM and Ford have midgets on their test tracks. Behind their interest in tiny cars is a solemn, confidential study by the Automobile Manufacturers Association keynoting two predictions.

One prediction is that by 1980 U.S. streets and highways will be blackened by 120 million cars (present total—64 million). The other is that in 18 more years three-quarters of our population will be living in urban and suburban areas.

The AMA study gloomily forecasts almost complete breakdown, by then, of rubber-tired common-carrier transportation due to traffic congestion.

The answer: smaller cars.

The feeling in the industry is that tiny cars will sell by the millions in a few short years if their engineering and price are right. Most important is a low price. The target is between \$1,200 and \$1,400. (The Cardinal would have sold for around \$1,700.)

Engineering will have to be tailored to manufacturing economy. Bodies will have to be durable and quiet, easily produced. Engines will have to be more powerful than those of current European imports, yet economical of fuel. They

might prove to be versions of the rotary Wankel engine [PS, Mar. '60, p. 82].

GM's and Ford's tiny cars are scooting around their proving-ground saucers encased in fiber-glass bodies. When put on the production lines, the bodies no doubt will be made of steel.

Dashboard of the future

An experimental Cadillac is tooling around Detroit streets equipped with what could be the controls and instrument panel of tomorrow. A look into the driving compartment reveals a brace of pedals on the floor—nothing unusual there—and a dash devoid of buttons, switches, or even a steering wheel.

Only when a hidden control is moved does a 16-inch section of the panel slide away to uncover the buttons for working the transmission, lights, horn, turn indicators, radio, heater and air conditioner. Steering? That's done with a couple of knobs about three inches in diameter that fit nicely into the palms of the driver. You can steer with either knob.

Those who have had the chance to drive the car say that the method of steering feels strange for only the first five or ten minutes.

Fly-it-yourself copter

One of Detroit's suppliers to the auto industry is in the midst of development work on a small, one-man helicopter that would sell for \$2,500 to \$3,000. It would have a top speed of 75 miles an hour, a range of 300 miles, and get 15 miles to the gallon.

Disappearing seat belts

GM's Ternstedt Division, which makes seat belts, is experimenting with ways to retract them when not in use. Among the prototypes: a unit that retracts them manually with a cord and spring, an automatic unit with a spring on the back of the seat, and a third one equally automatic that stores each side of the belt in a container the size of a bar of soap.



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 - 3rd—Parnelli Jones
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 - 7th—Bob Betts

**JULY 4: GRAND NATIONAL NASCAR
FIRECRACKER 250**

- 1st—Fireball Roberts
- 2nd—Junior Johnson
- 3rd—Marvin Panch
- 4th—Jack Smith
- 5th—Jim Pardue
- 6th—Larry Frank

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JUNE 10: ATLANTA 500*

- 1st—Fred Lorenzen
 - 2nd—Banjo Matthews
 - 3rd—Bobby Johns
 - 4th—Fireball Roberts
 - 5th—Troy Ruttman
 - 6th—Paul Goldsmith
 - 8th—Marvin Panch
 - 9th—Junior Johnson
 - 10th—Jim Paschal
- *Race halted by rain after 327 miles.

MAY 30: INDIANAPOLIS 500

- 1st—Rodger Ward, 140.293 mph. new record
- 2nd—Len Sutton
- 3rd—Eddie Sachs

MAY 27: CHARLOTTE WORLD 600

- 1st—Nelson Stacy, 125.552 mph, new world's record
- 2nd—Joe Weatherly
- 3rd—Fred Lorenzen

MAY 12: DARLINGTON REBEL 300

- 1st—Nelson Stacy
- 2nd—Marvin Panch
- 3rd—Fred Lorenzen
- 4th—Jack Smith (John Allen)
- 5th—Cotton Owens
- 6th—Larry Frank
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- 10th—Jim Pardue

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WEEKS**

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- 1st—Fireball Roberts, 152.529 mph, new world's record
- Daytona Continental
- 1st—Dan Gurney
- 250 Mile Modified National Championship
- 1st—Lee Roy Yarbrough, 146.723 mph
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When the late "Boss Ket" of General Motors began designing his high-compression engines—which first came to fruition in the Olds 13 years ago—he little dreamed what was in store for the future. The Olds engine had a compression ratio of 7.25:1. Ratios are now running as high as 14:1. The Chrysler Corp. is pack leader in pushing up the figures, and the product, higher power, is of course used exclusively for closed-circuit and drag racing.

These compression ratios do not come without cost. Unless aviation-grade gasoline is used, engines detonate. Other illnesses develop, too—a mysterious rumble in the crankcase, and damage to the main bearings and main-bearing caps. One fix for the bearing problem is to aluminize them.

The only important mechanical change

in the supercompression engines beyond that is the substitution of higher-domed, forged-aluminum pistons for cast-aluminum ones. Chrysler does strongly recommend to the buyers of such engines that they use wide-open throttle in bursts of only 12 to 15 seconds.

A piece of folklore dies

It's commonly thought that the best way to prevent brake fade on tough descents is to "fan" the pedal. Engineers for the Thermoid Division of the H. K. Porter Co., Pittsburgh, now say no.

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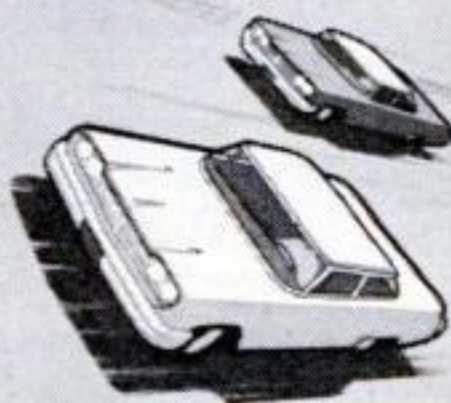


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How much you earn depends largely on you. You need no special skill, no large investment. Start spare time until full time justified. Hire helpers as needed.

NO SHOP NECESSARY • You clean upholstered furniture with efficient **PORTABLE ELECTRIC DETERGER** on customers' premises—homes, hotels, motels, etc. Auto upholstery, too. No hauling; operate from your home. Watch business grow as customers tell friends. Supplies cost little; what you take in is mostly profit. If you want to be independent—free from layoffs, bosses—start this profitable year-'round business of your own. We will help you to start and work with you for your success.

OURS IS NOT A LEASE ARRANGEMENT • You are free to operate in an independent manner. You sign no contract. You own the detergent outright and are always *your own boss*...and every dollar you take in is *yours* to keep. You pay no fees, or dues, or royalties to anyone. And *you* take no risk. Your detergent is fully guaranteed and enough supplies come with it to return far more than your investment. Many earn the cost of the detergent in a week or two. It costs nothing to get the details...write **TODAY**.

**MAIL COUPON TODAY
FOR FREE BOOK**

VON SCHRADER MFG. CO.
N11 "D" Pl., Racine, Wis.

Without obligation rush your **FREE** booklet about how I can start *my own* permanent, profitable electric Upholstery Cleaning business.

Name _____

Address _____

City _____ Zone _____ State _____

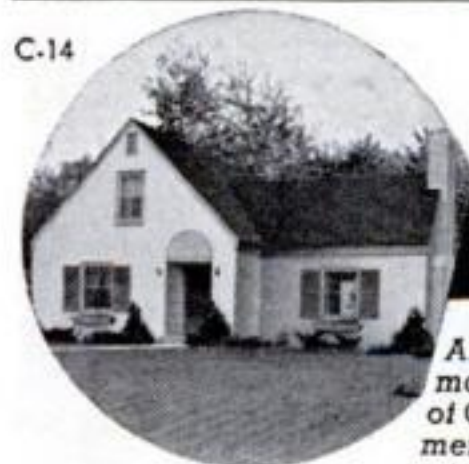


**get into operating or repairing
EARTH MOVING EQUIPMENT**

Men needed now for good paying jobs in booming road and construction work. Learn operating or repair-rebuilding of heavy road machinery, cranes, bulldozers, earth carriers, etc. Actual "on the job" training. 5 to 13 1/2 week courses. Classes start every Monday. Reserve your space now. Complete catalog and reservation facts **FREE**. Approved for veterans. Write

Greer TECHNICAL INSTITUTE
Attn.: S.L. Hutch, Box 368, Braidwood, Ill.

C-14



**COLORCRETE
CAN BE YOUR
OPPORTUNITY**

All over the country, men are making money as applicators of Colorcrete—the beauty treatment for old, drab, time-worn masonry surfaces. Stucco, concrete and the like can be transformed in brief time and at relatively low cost into surfaces that gleam in colorful beauty. Colorcrete is good for homes, stores, schools, motels, garages, service stations and other public and commercial buildings. Range of 16 colors.

Every community can support a Colorcretor — and many territories are still available. Investment required is very moderate. Write at once for Opportunity Book.

COLORCRETE INDUSTRIES, INC.
572 Ottawa Avenue, Holland, Mich.



**TURN 58c INTO \$6.00 CASH PROFIT
AT HOME IN SPARE TIME—METALIZING**

Now you can invest 58c in material and get back \$6.95 and make \$6.00 for your time in this fascinating home business. Hundreds make good extra money in sideline work. So Easy—so much Fun! "Eternalize" baby shoes, other keepsakes. Big market everywhere. No face-to-face selling. Write for facts **FREE**, plus financing plan. No obligation. No salesman will call. **WARNER ELECTRIC**, 1512 Jarvis, Dept. M-3-L, Chicago 26, Ill.

ENGINEERING



Heald's Micro-wave
and Radar
Laboratory Equipment.

**ENROLL NOW
FOR NEW TERM**

**AMERICAN INDUSTRY NEEDS
TRAINED ENGINEERS NOW
BACHELOR OF SCIENCE
DEGREE, 30 MONTHS**

SAVE 2 YEARS' TIME

B.S. Degree Courses:

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|---|---|
| <input type="checkbox"/> Electronic Engineering | <input type="checkbox"/> Mechanical Engineering |
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Civil Engineering |
| | <input type="checkbox"/> Architecture |

Diploma Courses:

- | | |
|---|---|
| <input type="checkbox"/> Radio-Television Plus Color Technician | <input type="checkbox"/> Architectural Drafting |
| <input type="checkbox"/> Electronic Technician | <input type="checkbox"/> Mechanical Drafting |
| | <input type="checkbox"/> Structural Drafting |

APPROVED FOR VETERANS

Send for **FREE** Information

HEALD Engineering College

Van Ness at Post, Dept. PS-1062 San Francisco, California

NAME _____

STREET _____

CITY _____ STATE _____

A number of one-man mail order enterprises are paying their owners an income of \$40,000 to \$50,000.

SPECIAL OPPORTUNITIES



Mail order is big business. Annual catalog sales volume of Sears, Roebuck and Co. is over 700 million dollars!

HOW TO START

Your Own Mail Order Business

You can make a fortune by mail. New firms will set you up in a fabulous mail order business of your own! They'll make up your catalogs, prepare your advertising, supply mailing lists and even ship your products for you!

By Robert Stephenson

When Anthony Sambati injured his back and was laid off from work he never dreamed it would be a blessing in disguise. Bedridden for weeks, he decided to start a small mail order business. This was something he could run right from his own home and required very little capital to begin. In fact, Sambati started with less than \$85.00.

(Advertisement)



After a short time in mail order, Sambati soon had a beautiful home with all the luxuries of a successful businessman.

He figured that a small mail order business might provide a temporary income to support his family until he got back on his feet. His first step was to obtain a franchise from a large wholesale mail order firm which supplied him with all the necessary catalogs and mailing literature. It wasn't long until his spare-time venture blossomed into a booming enterprise. Drawing a small salary and pouring the rest of the profits back into the business, he soon had others working for him! Today he owns a large retail store, his own warehouse and a beautiful home with all the luxuries of a successful businessman.

Sambati's story is typical of a number of men and women who began a small mail order business with absolutely no previous experience, and made a huge success of it. These 'little' people are quietly pocketing big profits every day—many content to keep the business small . . . spending an hour or two each day in the privacy of their own home. No bosses, time clocks or small pay envelopes. No door to door selling, in fact, you never even meet your customers face to face.

Yes, a small one-man mail order business is ideal for anyone wanting a chance to gain financial security and independence. Yet thousands try mail order each year and fail, simply because they don't learn the few simple secrets of success early in the game.

Take the case of Bud Sheer who had been working for a theatre in a small New Jersey town. With only a few hours spare-time to spend each morning, he tried mail order to supplement his regular income. Like many beginners in this field, Sheer was faced with the problem of finding good mail order items which would have a high mark-up and repeat sales potential. But the biggest obstacle was the expense of printing a catalog.

Then he heard about the A. J. Statile Co. of Hillsdale, New Jersey — an organization set up to aid the small mail order beginner.

He wrote to A. J. Statile Co. for full information, sent in his application for a franchise and within a short time the cash began rolling in. Today Bud Sheer owns the theatre he once worked for. Sheer attributes his success in mail order to the A. J. Statile Co. Actually, the theatre he owns has become a side investment.

He still uses the beautiful 300 page mail order catalogs supplied by A. J. Statile Co.

How does the Statile Co. help the beginner get a sound start in mail order? Very simply. Just as Henry Ford made automobiles within the reach of the general public—by mass production and large volume.

Let's take a few specific examples:

(1) All franchised dealers of A. J. Statile are offered ready to mail catalogs and sales literature. Each mailing piece has the dealer's name and address printed right on it. By printing millions of catalogs, Statile is able to offer these at a fraction of their regular cost. The artwork and layout costs for these catalogs would run into thousands of dollars for the beginner if he were starting from 'scratch'.

(2) Since all mailing material and catalogs contain your name and address, all orders come directly to you. Yet you don't have to invest one penny in inventory. All merchandise is stocked for you. In fact Statile has over \$3 million dollars worth of mail order merchandise at your disposal.

(3) All packaging and shipping is done for you. You simply send a shipping label to Statile together with the wholesale cost of the items, and the merchandise is shipped directly to your customers under your own shipping label.

(4) A consultation service is provided to answer any questions you may have. You receive a secret list of over 100 national magazines which run free ads. You'll be shown how to obtain free publicity on your own mail order items. In addition, you obtain trade names and addresses of over 150 other mail order wholesalers who drop-ship top mail order items for you. You'll also be given all the government laws and regulations pertaining to a home operated mail order business. These laws are a 'must' for all beginners.

All this valuable information is covered in the Statile Mail Order Survey which every new franchised dealer receives from Statile before they begin. Formerly sold for \$25.00, this survey has become the 'bible' of the trade. Mr. J. M. of Baltimore, Md., writes, "To tell the truth, all the information in regard to obtaining free ads is alone worth the \$25.00 I paid you . . ." J. D. of Kalamazoo, Mich.,

(Advertisement)

states, "Just a personal note to say I am most satisfied with my \$25.00 investment. Your sales plan is simple and well organized . . ." These are only a few of the many testimonials received praising the Statile Mail Order Survey.

(5) The catalogs and mailing literature offered by Statile Co. cover every conceivable mail order item. You select the field you are interested in . . . **BABY ITEMS, TOYS, APPLIANCES, VITAMINS, BOOKLETS AND**



The thrill of receiving money in your morning mail is one you'll never tire of.

MAIL ORDER COURSES, you name it, Statile has the catalog or mailing piece. Select your market, order your mailing literature and you're in business.

(6) You'll be told how to compile your own mailing lists—and this is the most important part of your business. Many a beginner has fallen by the wayside simply because he mails his catalogs to a poor list of names. Suppose, for example, you offered a beautiful scale model of a 40' Chris-Craft cabin cruiser by mail. You would probably make your mailings to boating enthusiasts and the chances are that nine times out of ten your mailings would show a loss instead of a profit. How would Statile help you solve this particular mailing list problem? He would show you where to get the names and addresses of *actual owners* of 40 foot Chris-Craft cabin cruisers! Surely every owner would like to have a scale model of his own boat. Strange as it may seem, such a mailing list is available to anyone. The secret is where to find it. This is just one example of how an experienced mail order expert giving you personal advice, may mean the difference between success and failure!

This same method of obtaining selective specialized mailing lists may be applied to practically any market . . . selling baby items to new mothers, selling toys to young children, etc., etc.

So much for starting your own mail order business. Now, a word of caution. **OBTAIN YOUR MAIL ORDER FRANCHISE FROM A**

REPUTABLE MAIL ORDER FIRM. Unfortunately, during the past few years a number of ads have appeared in newspapers and magazines offering to start people in mail order. The ads are grossly misleading. Many imply that you can become a millionaire over night if you use their catalogs. Beware! Particularly if they operate their own mail order business direct to the consumer. These firms compete with their own franchised dealers! They could just as well mail all the catalogs themselves. They don't need you.

Other shady firms fail to drop-ship your orders promptly, thereby losing customers for you. In mail order, prompt shipment is an absolute requirement for a successful operation.

Deal only with firms whose business is preparing catalogs and shipping merchandise. They operate on a strict wholesale basis for franchised dealers exclusively. Such a firm is the A. J. Statile Co. Letters from successful franchised mail order dealers speak for themselves. A woman from Milwaukee writes, "It has been better than my expectations." A gentleman from California states "we are quite pleased with the response we are receiving." Another man from Wisconsin writes, "To say the least, I am more than satisfied."

Yes, a small mail order business offers you an opportunity to earn a second income, or—if you work at it in earnest, a chance to strike it rich. The young housewife in St. Louis may be content to make an extra \$20.00 a week . . . the office worker in Los Angeles may be aiming for \$150.00 weekly full time business . . . and the ambitious schoolteacher in Newark may reach \$20,000.00 a year. What is your objective? Set your own goal, pick your own hours, and the sky is the limit.

Even a government report stated that a number of the most successful one-man mail order enterprises make as high as \$40,000 to



Big firms will carry all stock for you. They ship orders direct to your customers using your own shipping labels.

Your Own Catalogs of Top Mail Order Items!



A. J. Statile Co. will prepare your catalogs, write your sales letters, supply mailing lists and even ship merchandise for you, using your own shipping labels!

\$50,000 a year! But frankly, this is the exception rather than the rule. Most mail order operators are content to earn a comfortable living doing little physical work, but enjoying their work thoroughly! We don't say you'll be a mail order millionaire or another Sears & Roebuck, but if you're looking for a business of your own with financial security, the answer is mail order. If you've already tried mail order with little or no success, don't give up! Try to analyze what went wrong. Success comes only to those who keep trying and learn from their own mistakes. Again we emphasize, deal only with a reputable firm.

The A. J. Statile Co. has been in business for over twelve years.

They gladly furnish bank or trade references upon request. They are probably one of the largest mail order wholesalers in the country. Whether it be toys, gifts, vitamins or appliances—they've got it ready to ship under your label **WITHIN 24 HOURS!**

Firmly convinced that no other business offers the tremendous opportunities of mail order, A. J. Statile, president of the firm, is an outspoken advocate of the man or woman who wants to start in business for himself. As Statile puts it, "by all means, start your own business and start **NOW!** If you want a chance at security and financial independence make your choice mail order. There's nothing like it. Absolutely nothing!"

FOR FREE DETAILS

Mail coupon below — no obligation

A. J. Statile Co., Dept. 45 • Statile Building • Hillsdale 45 N. J.

Dear Mr. Statile:

Please send me complete **FREE** details telling me how I may obtain a franchised mail order dealership with your firm. I understand I am under no obligation and no salesman will call on me.

NAME..... AGE..... SEX.....

ADDRESS

CITY..... ZONE..... STATE.....

PREVIOUS EXPERIENCE, IF ANY.....

(Advertisement)

**NEW
SPACE AGE
HOBBY!**

IT'S EASY TO BUILD-YOUR-OWN ***knight-kit***[®] ELECTRONIC MARVELS!



THE ONE AND ONLY "SPAN MASTER"®

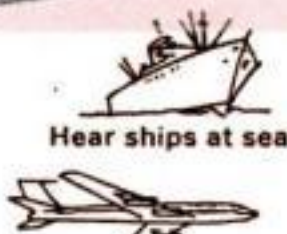
World-Wide 4-Band Shortwave Receiver Kit

Hear everything on the fun-to-build "Span Master"—leader in its class for radio coverage, sensitive performance and value. Continuous tuning from 540 kc to 30 mc lets you hear ships, planes, direct broadcasts from London, Paris, Moscow, Berlin, Rome; tunes 160, 80, 40, 20, 15 and 10-meter Ham bands—plus powerful local AM reception and dozens of other exciting broadcast services. Features: Band-spread dial for easy tuning; fine-regeneration control; built-in PM speaker, plus headphone terminals for private listening. Complete with all parts, tubes, wire, solder, step-by-step instructions and handsome wood cabinet. 6¾ x 14 x 6¾". For 110-125 v. 60 cycle AC. Shpg. wt., 8 lbs.

**ONLY
\$25⁹⁵**
\$5 per month



Tune world capitals direct



Hear ships at sea



Tune favorite local AM programs



Hear planes in flight

NO MONEY DOWN
on Allied's Credit Fund Plan

83 YX 258BX. Span Master Kit, only **\$25.95**
83 Y 205. Outdoor Antenna Kit.....**\$1.03**
83 Y 207. Dual Headset.....**\$2.08**

Now! Drive As the Experts Do!

amazing **ELECTRONIC TACHOMETER KIT**

**ONLY
\$21⁹⁵**

\$5 per month

Auto and power-boat experts agree that for best fuel economy, lower engine wear and peak performance, an accurate tachometer is a "must." Here's your best "tach" value. Registers engine speed in rpm—electronically! Transistorized switching and zener diode regulation; 3% accuracy; illuminated dial; adjustable red pointer. For 1-8 cyl., 2-cycle or 1-16 cyl., 4-cycle engines using ignition coil and distributor of 9VDC; for magneto and 6-VDC Systems with external 9 v. battery (not supplied; below). Available in positive-ground and negative-ground models (most late-model American cars are neg. ground). With all cables, universal-mount swivel base, tension strap, easy instructions. 4⅞ x 3¼ x 3⅞". Shpg. wt., 4 lbs

83 Y 944BX. For Neg. Ground Systems
83 Y 980BX. For Pos. Ground Systems. Each.....**\$21.95**
83 Y 909. 9-V Battery & Accessories..... **\$1.50**



mounts on steering column or dash

**satisfaction guaranteed
or your money back**

TYPICAL OF THE VALUE AND
QUALITY OF OVER 100
GREAT KNIGHT-KITS

manufactured by
KNIGHT ELECTRONICS CORP.

A DIVISION OF

ALLIED RADIO

ALLIED RADIO

100 N. Western Ave., Chicago 80, Ill.

Ship the following:

- ☐ Span Master Receiver Kit 83 YX 258BX
 - ☐ Antenna Kit 83 Y 025 ☐ Dual Headset 83 Y 207
- ☐ Tach for Neg. Ground Systems 83 Y 944BX
- ☐ Tach for Pos. Ground Systems 83 Y 980BX
 - ☐ Ship No Money Down on Allied's Credit Fund Plan →
 - ☐ \$.....enclosed (check) (money order)

Name _____
PLEASE PRINT

Address _____

City _____ Zone _____ State _____

NO MONEY DOWN
on Allied's
Credit Fund Plan

New Credit Customers Only: Send name and address present employer, how long employed, position, monthly salary; rent or own home, how long at present address; give age (21 minimum for credit account).

POPULAR SCIENCE *75, 50 and 25 years ago...*

1887 "Telephonic communication between ships at sea has been described by Prof. Lucien E. Blake. A sound-producing apparatus was to be attached to each vessel under the surface of the water. For steamships the mechanism was to be a steam fog-horn or whistle,



specially constructed to sound under water and to be heard at least six or eight miles off. Each vessel was to have a sound-receiving apparatus to take up the signals, which would be coded.

"In October, 1885, signals were transmitted and received through one and a half miles in the Wabash River from a locomotive bell around three or four windings of the stream."

"Dr. T. Langdon Down, inquiring into the causes of idiocy, has found that intemperance of parents is one of the most considerable factors in producing the affection. His view is confirmed by a French doctor who has said that in [a] village whose riches were in its vineyards, ten years of comparative sobriety, enforced by vine-disease, had a sensible effect in diminishing the cases of idiocy.

"Of the professions, lawyers furnish the smallest proportion of idiots, while they are credited with the procreation of a relatively large number of men of eminence. With the clergy, these proportions are more than reversed."

1912 "How many men earn from \$750 to \$900? In other words, how many workmen receive sufficient wages to enable them to rear three children, give them nourishing food, warm clothes, a decent house, an education to their fourteenth year, and a legitimate amount of recreation?"

"About one half of adult males receive less than \$12 per week (\$600 per year); while less than one tenth receive wages of more than \$1,000 per year.

"The average length of life in The United States is only half what it might well be. Men born in American cities of native white parents live on the average only 31 years. The length of life in America is astoundingly short, and short because men and women have not the wherewithal to maintain efficiency—a fact which is fully established by the enormously higher death rates among the working classes."

1937 "Although the right side of your body is cooler than your left, your right foot and hand are warmer than your left one! That paradoxical fact was brought out by recent experiments at the Worcester State Hospital, Worcester, Mass. Scientists at the institution were making tests with a very accurate skin thermometer to see if the slight differences in temperature on the sides of the body might be useful in diagnosing mental diseases. Testing 40 subjects, they discovered that in all of them the right feet and hands were a little warmer than the corresponding members on the left side."

"Artificial tree stumps set up on a Russian rifle range help train Soviet sharpshooters to fire from cramped quarters and inclosed spots where it is difficult to aim accurately. In the photograph, an observer in the right-hand 'stump' peers through field glasses to check the target hits made by the sniper in the foreground."





Firestone's New Nylon Farm & Commercial Truck Tire!

Firestone Rubber-X gives it longer mileage!

The new Firestone Farm & Commercial truck tire has built-in performance features never available before at such a low price. ■ Examples: A Shock-Fortified nylon cord body for maximum protection against impact and moisture deterioration. Torque-toughened Firestone Rubber-X for longer tire life. A new tread design geared for superior wear and traction for all kinds of hauling. Plus another Firestone ex-

clusive: a cooler running, mileage-adding tire-shoulder design. ■ Whatever your hauling operation, Firestone has the Farm & Commercial truck tire for you priced so low, you'll think the price tag is wrong. New Farm & Commercial tires are available now in all popular sizes at your Firestone Dealer or Store—you can charge them or buy on easy terms. Remember, *you know what you're getting when you buy Firestone.*

Most Firestone Dealers and Stores are open weekday evenings until 9 o'clock for your shopping convenience.

Firestone

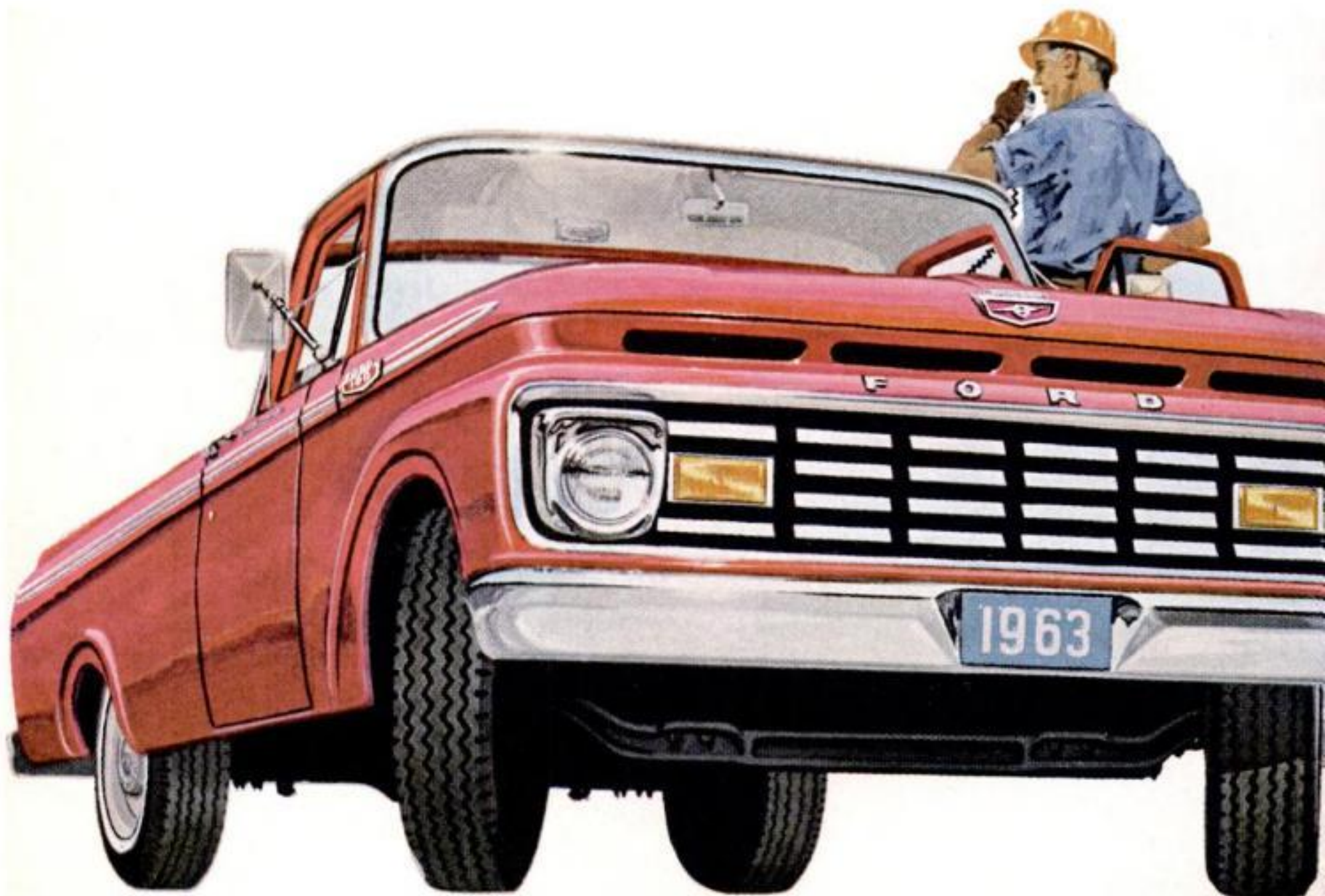
YOUR SYMBOL OF QUALITY AND SERVICE

Enjoy the Voice of Firestone Every Sunday Evening Over ABC Television

LOOK WHAT'S NEW IN '63 FORD TRUCKS!

NEW FRESH-STYLED PICKUPS— BUILT LIKE THE BIG ONES!

In axles, springs, frame, '63 Ford pickups have the same kind of durable design as big trucks. And you'll find new styling and a new feel at the wheel . . . new easier steering, new smoother shifting, new comfort!



New models! New engines! New reliability features throughout the most complete line ever offered by FORD

NEW! V6 and V8 Cummins Diesels cut engine weight 1000 pounds!

Up to 1000 pounds lighter than other Vee and in-line Diesels, new Cummins engines can add 50,000 ton-miles a year to a highway tractor's earnings. Compact and easy to service, the 588-cu. in. V6 develops 200 horsepower . . . the 785-cu. in. V8 produces 265 horsepower.

NEW! 8-door option for Ford's Econoline Van!

Now you can unload America's most popular Van from the street or curb, front or rear! Econoline saves loading time . . . saves on price, gas, tires and upkeep, too!



NEW! Transistorized ignition saves 3 out of 4 ignition tune-ups!

Electronic breakthrough—Perma-Tuned ignition! Transistors relieve points of heavy current, keep plug voltage high. Points and plugs last far longer; starting is easier; performance is better. No condenser to fail. Optional on Super Duty V-8's.

NEW! City-size Ford Diesels —4-cylinder, 6-cylinder!

New 330-cu. in. Diesels for tilts and 89" BBC models! New 220-cu. in. Diesels for parcel delivery units! In typical city operation, they can give twice the fuel economy of comparable gas engines!



NEW! Low gear synchronized for easier downshifting!

Only from Ford! Standard 3-speed transmissions in '63 Ford pickups and Econolines are synchronized in all forward gears. You can downshift to low while moving without gear clash. Helps maintain momentum, cuts chance of stalling in heavy going. Reduced stress extends gear life, too!

NEW! Over 30 major reliability advances!

New durability in big and small components. Added corrosion resistance in bodies! New weather-sealed electric connections! Lifetime lubricated speedometer cables! All to give you more trouble-free trucks—at Ford Dealers' now!

NEW 89" BBC LINE CUTS LENGTH, ADDS MANEUVERABILITY!

Priced between conventionals and tilts, new short "N" models range from 11,000-lb. GVW to big 76,800-lb. GCW. Both single- and tandem-axle series offer wide choice of Diesel as well as gasoline engines.



PRODUCTS OF



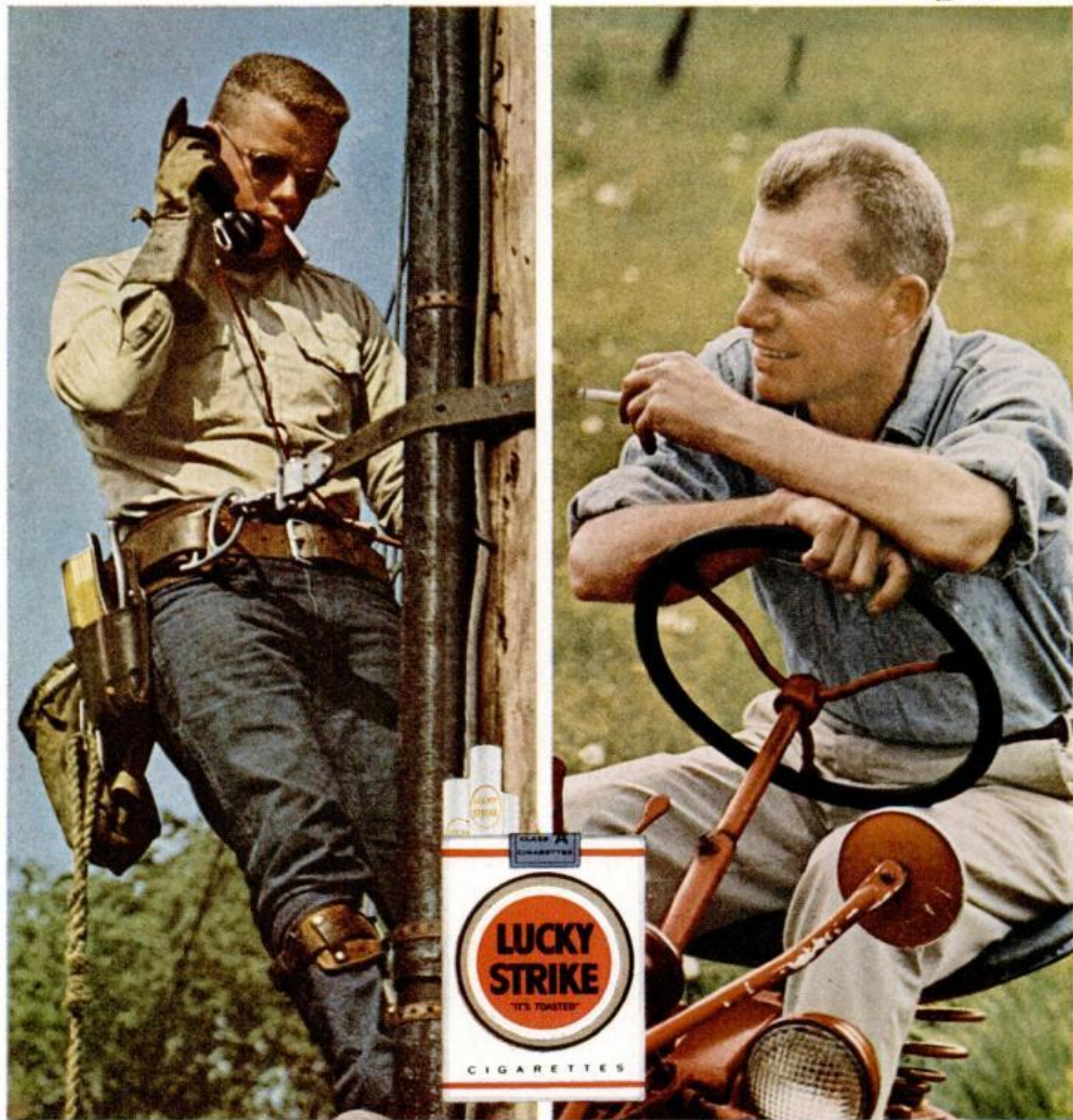
MOTOR COMPANY

FORD TRUCKS

**For
Outstanding
Reliability &
Durability**

Get Lucky

the taste to start with...the taste to stay with



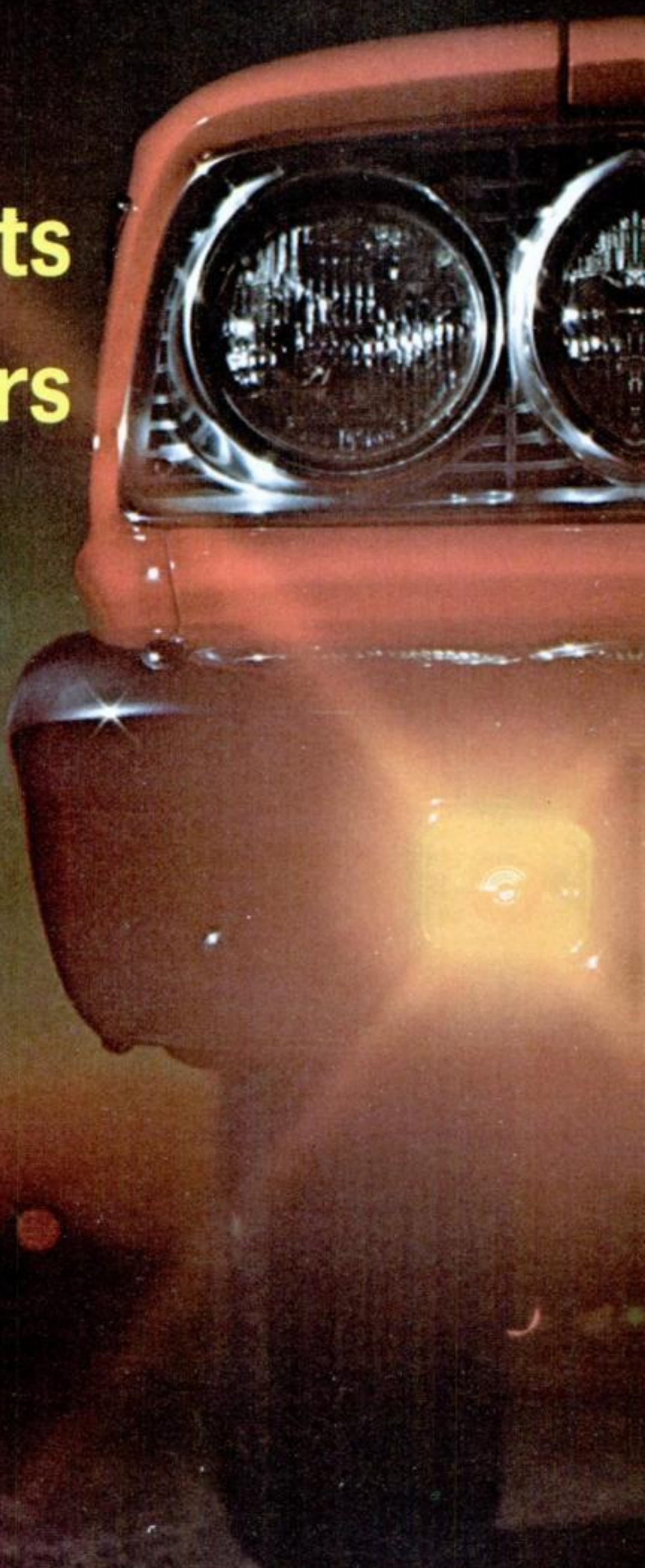
The taste of a Lucky spoils you for other cigarettes. This famous taste is the best reason to start with Luckies...the big reason why Lucky smokers stay Lucky smokers. How about you? Get the taste you'll stay with. Get the fine-tobacco taste of Lucky Strike.

Detroit Tests the '63 Cars

Take a look at the turn signal on the car at right. It's amber for better visibility. That's one way to spot the 1963 U.S.-made automobiles. Detroit took the wraps off hundreds of different models last month in showrooms throughout the land. This picture, and those on the color pages that follow, were taken at factory proving grounds, as the cars underwent testing. They are the result of a visit by **POPULAR SCIENCE** editors for a special preview of the new models.

We came away so impressed by the vast amount of testing that we arranged with each of the companies whose cars were being unveiled to

CONTINUED



DETROIT TESTS THE '63 CARS

photograph them as they were being put through their paces.

Two mint-fresh, voluptuous products of the technical research that is carried on throughout the year appear in this collection. They are Buick's Riviera and Pontiac's Grand Prix.

The story of what that research has produced for 1963 in engines, transmissions, brakes, ride, ease of control, and instrumentation appears farther on.

Buick coins a sportster

The Riviera, with a Cadillac's elegance and a Thunderbird's jauntiness, has 340 horsepower. It is being tested here for its ride and "spring rate."


The Galaxie — new trim, new look

Grille and some body panels, plus interior fabrics, are changed in Ford's "big" car. Water bath tests brakes and underbody seals.





DETROIT TESTS THE '63 CARS



Grand Prix — poshiest Pontiac

The Grand Prix's unusual vertical headlamps are matched by an unusual concave rear window. The instruments are recording, among other things, crankcase oil pressure and horsepower output.

Wagons join Fairlane line

Brand new for '63 are three different station-wagon versions of this car, as well as a hardtop and a sports coupe. The wagon pictured is flying off a ramp to test the bounce and rebound of its suspension.





Plymouth grows longer

Once again with that big-car look—result of a long rear overhang—the Plymouth is back to sass Ford and Chevy. Test is on acceleration.



DETROIT TESTS THE '63 CARS



Merc's rear window drops

Encased in sheet metal that is practically all new, the Monterey has a reverse-slant, power-operated rear window. This echo-less room checks the car's soundproofing.

Disk brakes for the Lark

The standard Studebaker is stepping out in the company of its sister, the plush Avanti—at least in brakes. The front ones are disks. The cart behind tests acceleration.





The Chevy: a new engine

*A spanking-new engine powers the six-cylinder version.
There's lots more, including a transistorized radio.
Test is to see how the car keeps its feet in a hard turn.*

The Chrysler is shorter

*One of the surprises of the new model year is a Chrysler
that's four inches shorter—overall length, 215.5 inches.
The New Yorker illustrated is entering the test track.*





DETROIT TESTS THE '63 CARS



Comet has a convertible

Another soft-top entry among the compacts is the Comet. The flossy extras include even an engine tachometer. The proving-ground test clocks its agility on a steep hill.

The Tempest grows muscle

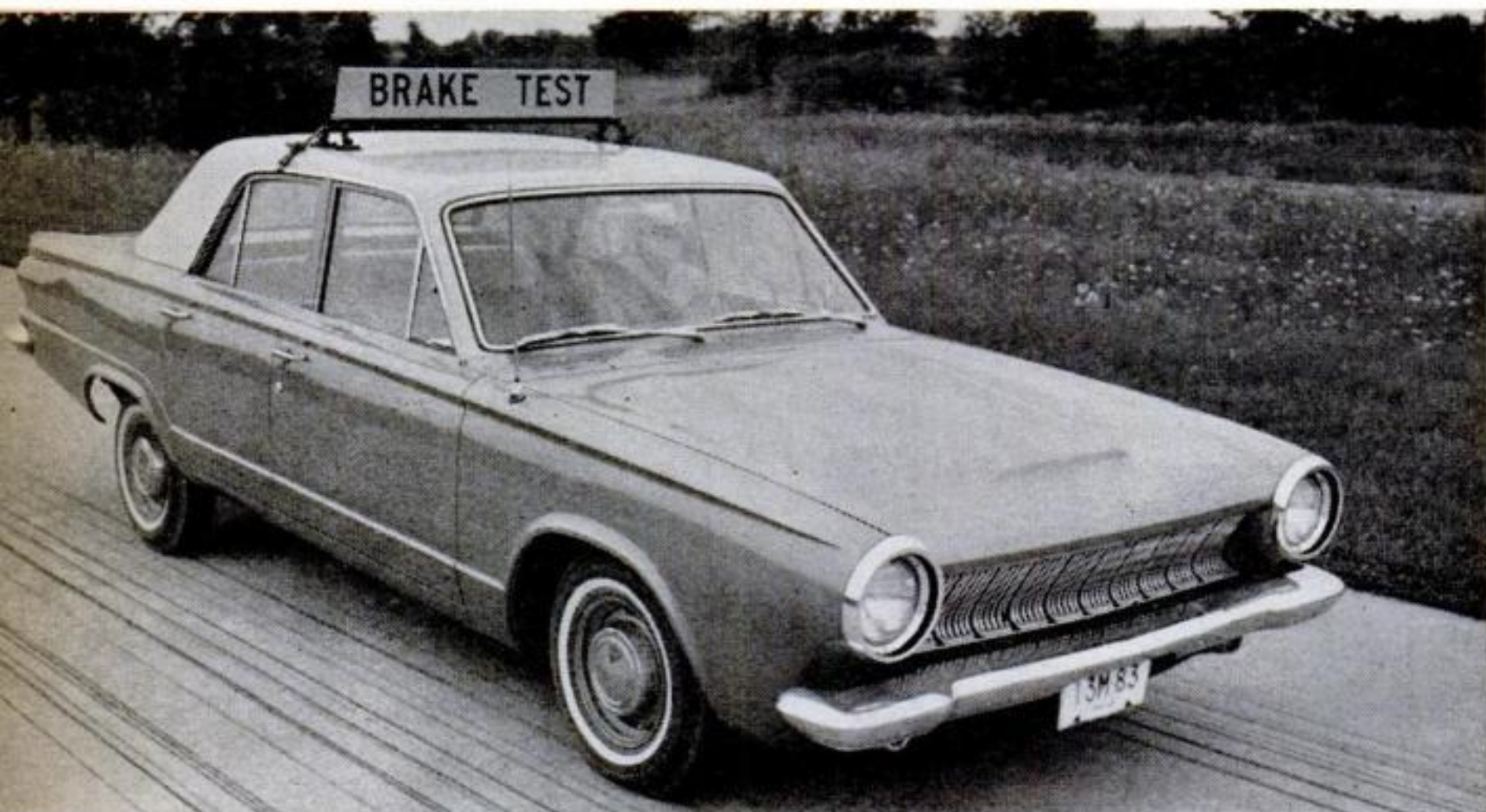
The Tempest's first convertible, the Le Mans, is five inches longer and comes with an optional 264-horsepower engine. The water barrage tests the car's rain-tightness.

The Dodge goes whoosh!

Biggest horsepower announced so far for 1963 cars is the Dodge's—420, a Polara option. Here the car starts through timing traps in a test on the quarter-mile run.



DETROIT TESTS THE '63 CARS

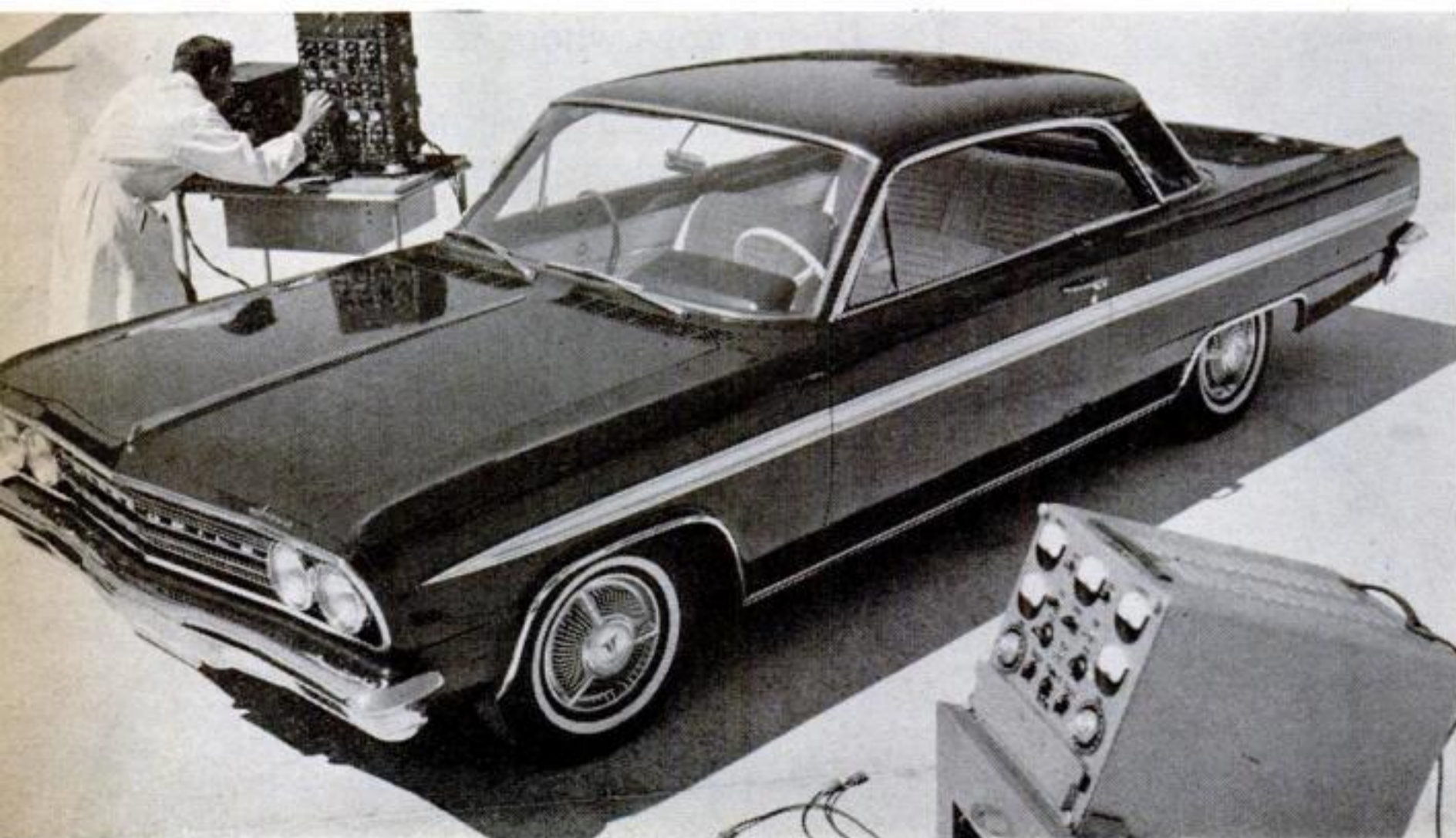


The Dart: a "senior compact"

At an overall length of 196 inches—seven inches longer than the '62 Lancer—the Dart is Dodge's version of a smaller car. Test measures the car's stopping distance.

Olds moves an engine

The middle front-seat passenger has a lot more foot room for '63. Moving the engine forward reduced the tunnel height. Here an oscilloscope tests engine vibration.





THE '63 CARS

... and now for the facts and figures

By Devon Francis

NOW that you have seen the 1963 cars in their test settings on the preceding pages and on our cover (reproduced at the left above), POPULAR SCIENCE is going to give you a more intimate look at them. And more—we'll give you a chance to drive some of them, by proxy. Here's what's what with the new crop of automobiles:

**Power,
whew!**

The size and diversity of optional horsepower is staggering. In the bigger engines, 400 horses seems to be par for the course, but they range upward of 425. Even some of the compact cars have blown their tops on power. Transistor ignition is here at extra cost.

**Lots more
models**

The motorist's choice among models (sedans, hardtops, wagons, convertibles) is dizzying. There are more than 300. With options, the number of differently styled, differently equipped automobiles runs into the thousands.

Those extras

The array of accessories is astonishing. Want an AM-FM transistor radio? Pshaw, that's simple! You can even get stereophonic sound. Bucket seats, four-on-the-floor transmissions? Naturally. Supercharger, tachometer, remote-control deck lid? Rear-window defroster, speed reminder, load levelers, electric tailgate? Just ask.

**Low
maintenance**

Moneysaving, sparse-service engineering has flourished. One company now guarantees its engines and drive trains for 50,000 miles. The 30,000-mile lube and 6,000-mile oil change are commonplace. So are alternators in place of generators. So are elaborate factory body dips to fight rust.

Styling

What has been done to the appearance of the cars is something else again. The most damning criticism of U.S. automobiles is that all makes look alike. For 1963, with rare exceptions, they do. In fact, it's hard in some instances to tell a '63 from a '62.

Some of the cars—inevitably, it seems—are bigger than last year's. A handful are a smidgin smaller.

In addition to amber turn signals, all the new cars have plumbing to return crankcase fumes to the cylinders for reburning to cut down on smog.

This month, in advance of Detroit's Auto Show, October 20-28, the last of the '63 lines will be announced.

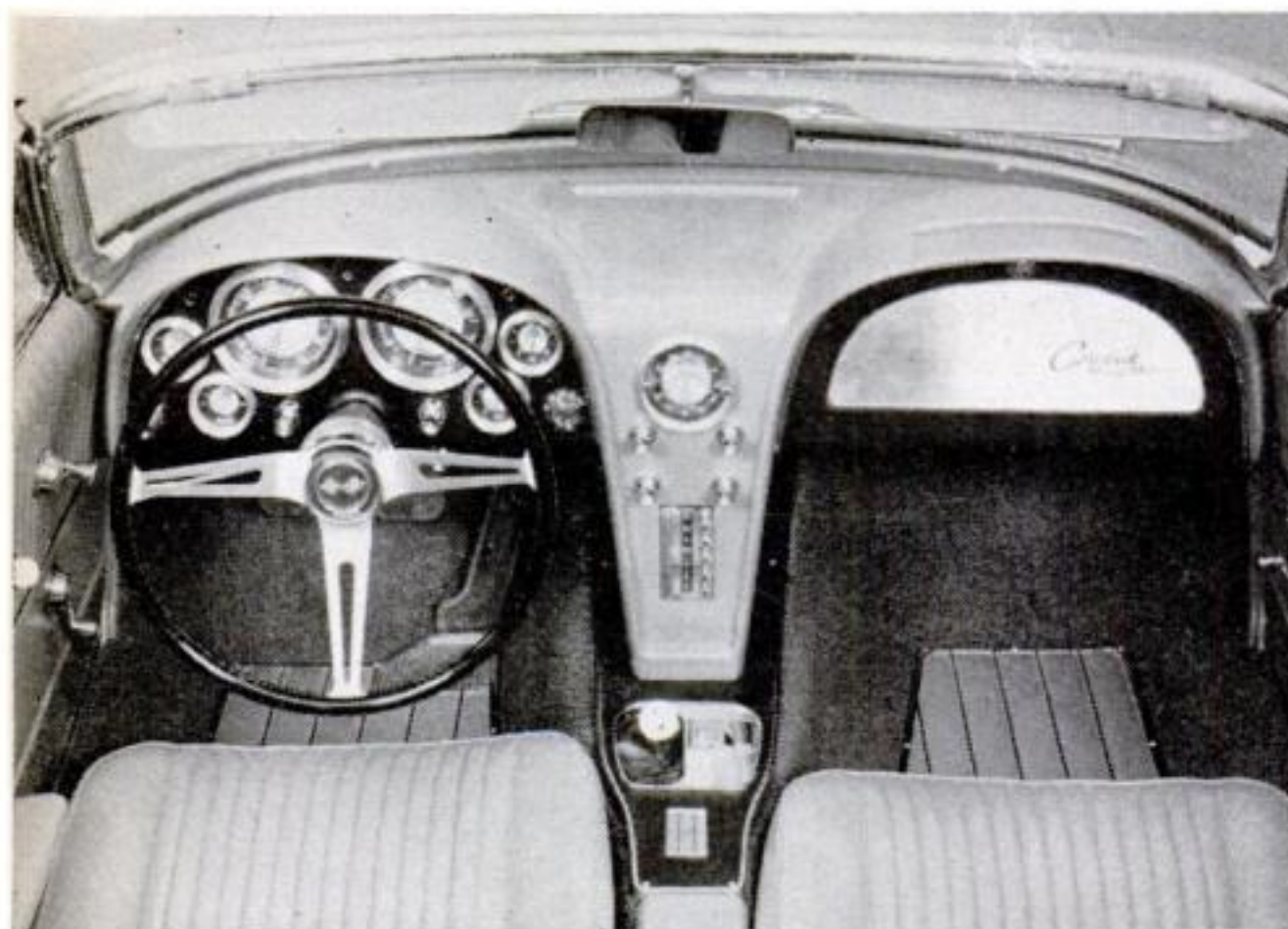
NOW TURN THE PAGE.....

What's new at Chevrolet

- a fetching sports car
- horses, horses, horses!
- self-adjusting brakes
- alternators instead of generators
- extended lube periods

A new Corvette bows in

Sports car's independent rear suspension and standard Chevy drip-dry rocker panel pace developments at this GM division



Controls for a new mixed-air heater are mounted on cockpit console.

WHEN Chevrolet Motor Division trotted out its 1963 automobiles last month, one of its four brands stood out like a swan in a flock of mallards. It was the dashing Corvette, America's only true sports car.

The frame was new. The suspension was new. The weight distribution was

new. Part of the name was new—it was now the Corvette StingRay.

There was even a new model in the line, a rakish sports coupe that looked like a Jaguar. It had class. It had sass. It was styled for the express purpose of creating passion in the breasts of men weary of Detroit's parade of look-alike cars.

For those whose affections could not be torn from the

more conventional Corvette, there was the standard soft top and a removable hardtop.

The '63 Corvette still faintly resembles the sculptured-fender sports car that Chevy restyled in 1956. It still offers engines ranging in horsepower from 250 to

[\[Continued on page 212\]](#)

Driving the new Corvette

This sleek coupe looks at first glance like an E-type Jag with gland trouble. The one I drove had a 300-hp. engine with a large four-barrel carb and hydraulic lifters. The gearbox was a smooth Borg-Warner four-speed.

I think it's easier to get into than the '62 model. The dogleg in the windshield is gone, the roof is notched, and the seats are lower.

Leg room is still skimpy, though slightly improved over last year. One nice feature: Seat cushions and backs are adjustable for tilt.

The steering wheel, even with adjustment, is too close to allow the straight-arm driving favored by many sports-car drivers; but then, the not-too-fast steering—3½ turns lock-to-lock—wouldn't make this position practical anyway. (You can change the steering ratio, with a wrench, from 19.6:1 to 17:1.)

Behind the seats is a sizeable luggage space.



Corvette StingRay is two inches lower than '62 model. Car's shape helps cut wind drag.

Chevy For several years the Chevy passenger car has carried on a bland now-and-then flirtation with an engine of 409 cubic inches used in the heavier Chevy trucks. It was available on special order.

Now Chevy has formalized its addiction to huskier horses. The 409 engine, turning out 425 hp., is, for the second straight year, listed as a regular option.

On the saner side, Chevy has its second in-line six-cylinder engine since the year 1929.

Improvements in the standard car are, for the most part, subtle. Windshield pillars are straight, making it easier to get in and out of the car. Brakes are self-adjusting. An alternator replaces the generator. The lube period is extended from 2,000 to 6,000 miles, or every six months. Transistors replace tubes in the radio.

In a car's rocker panel, moisture and dirt collect. The panel rusts eventually. Chevy engineers have routed rain water through the rocker panels to flush them. Then air, following the same route, dries them.

For short trips it can also accommodate a child sitting laterally in a penitent position.

In stock form the car is softer-sprung than imported sports cars. Happily, stiffer springs, discontinued in 1962, are again optional for competition. Despite its softness, our test car with standard suspension handled quite creditably. The independently sprung rear end can be drifted accurately through corners, and a light tap on the loud pedal sets things straight again. The tendency to fishtail out of a corner,

Chevy II This in-between car has a new grille, new interior trim, self-adjusting brakes, and improvements in the front suspension and steering linkage. The 300 and Nova 400 series sport new body side moldings.

The car goes 6,000 miles between lubes. An addition to the line: the Super Sport with—what else?—bucket seats, a floor-mounted selector lever when the transmission is automatic, and all manner of Christmas-tree baubles to drool over.

The Super Sport is available either as a coupe or convertible. Its instrument cluster includes a clock and gauges (instead of warning lights) for oil pressure, ammeter, and engine temperature. Special wheel covers are supplied, but whitewalls are an option.

Corvair Adhering strictly to its body lines at birth in 1959, the Corvair has some new chrome, new tail lights, new interior trim, a new color called Fawn.

The most important changes are not visible. Brakes are self-adjusting. The front suspension is firmer. Heavier aluminum interior coating on the exhaust pipe defers rust. Transistors replace tubes in radios. Carried over as an option: the Monza Spyder with a supercharged, 150-hp. engine. Greenwood station wagons have been dropped.



Corvair retains all of its basic sheet metal.

exhibited by earlier models, is gone. Lean is mild.

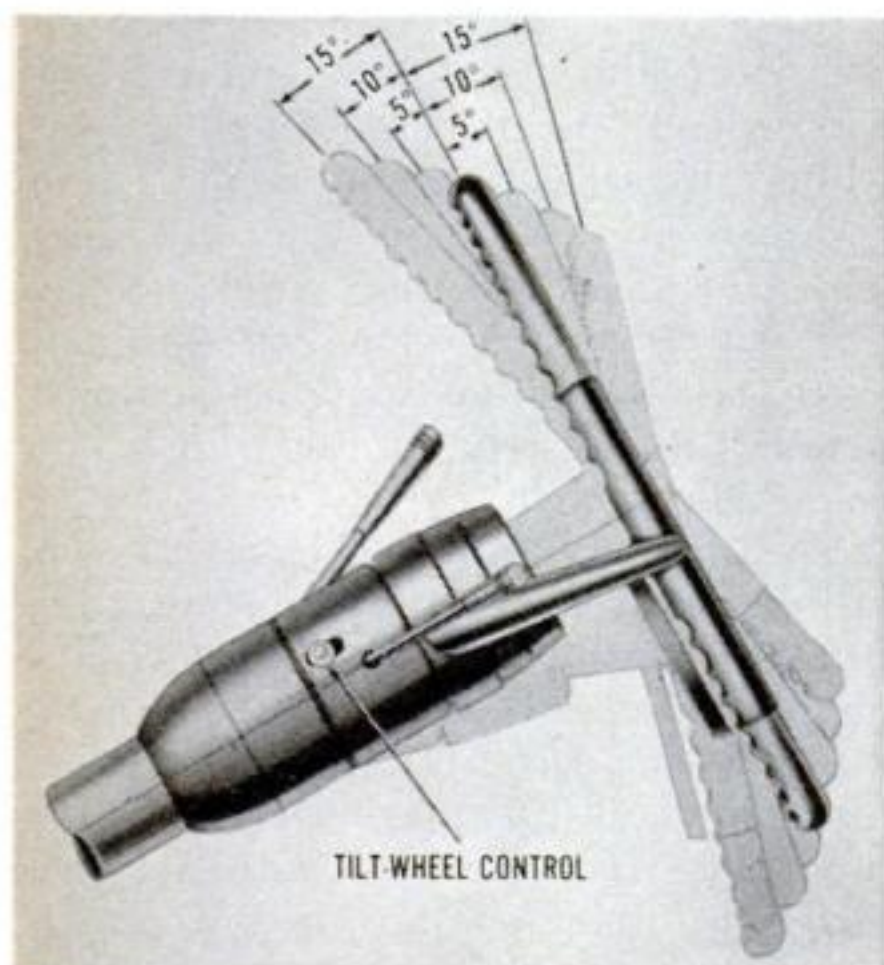
Acceleration? With only 130 miles on the odometer and 3.36 gears in the rear end, I ran 0-60 m.p.h. in 8.4 seconds and 40-70 m.p.h. in 6.5. If this isn't good enough for you, try a well-broken-in 360-hp. job with more zest in the axle ratio. Or if you're lazy, order a milder engine with slushbox and power steering and brakes. These babies come tailor-made as mean or as docile as you like.—Alex Markovich.

What's new at Pontiac

- a transistor ignition system
- horses, horses, horses!
- a classic Grand Prix
- safety-recessed control knobs
- lighter, thin-walled engines

Pontiac: A new ignition

Deadpanning a major piece of its news, this factory adds two razzmatazz models and recesses controls on its instrument panel



Tilting steering wheel lets you take your pick of seven positions for driving comfort.

PONTIAC had a chunk of major news for 1963—a transistorized ignition system. (Other prospective users as of now: some versions of Ford's T-Bird and Galaxie, and of Mercury's Monterey.)

True, Pontiac's new ignition comes at extra cost. True, it's available only on high-compression engines. But for Pontiac, as for all the U.S. automobile industry, it is a portent of things to come.

As described three years ago by POPULAR SCIENCE [May, '59, p. 94], a transistor spark system for a piston engine is designed to last for a car's lifetime. It provides a hotter spark, quicker starting. It's easier on plugs. It does away with distributor points and a condenser.

Fully transistorized, trouble-free ignition systems for all cars are as inevitable as tomorrow's sunrise.

Driving the new Tempest

The 1963 Tempest with that wicked 326-inch V-8 is a likeable car—a whole lot more so than last year's model. I thought the seating position excellent. The buckets give as much lateral support as any from Detroit. Instrumentation, what there is of it, is well designed. A circular speedo and tach sit right in front of the driver. All other engine data are relayed via little blinking lights.

Visibility is fine. So is the angle and distance of the steering wheel. But oh, that slow steering—a painful six turns lock-to-lock. This is excessive even for a big car; for a compact, it's unbelievable.

Ride is on the soft side, as in previous years. Handling is eerie at first; the independent rear suspension is responsible for strong oversteer—a tendency of the turn to sharpen up on you

and of the tail to slide out. But thanks to redesigned rear-suspension geometry, wider track, and slightly firmer springs, the breakaway point comes with more warning. With practice, I could use the oversteer to get around corners faster. If you try it, keep one eye open for the boys in blue. They usually don't approve.

Heavy-duty brakes are standard with the V-8. They consist of large finned drums in front and longer primary brake shoes all around. All stops were fast, firm, and straight. Fade was minimal.

If you've driven a four-cylinder Tempest recently, the performance of that big 260-hp. 326-incher will really startle you. I batted out a 0-60 time of 8.1 seconds—with a 2.91 rear end and automatic box, no less. The 40-70 run took six seconds flat. That's handy in passing on two-lane roads.

I keep wondering what she'd do with a four-speed stick.—A.M.

Pontiac did have other news of consequence. It pulled the shrouds off a sleek model called the Grand Prix. The name was borrowed from a last year's model, but this Grand Prix is a new car in its own right, classic in line and with an attractive minimum of decoration.

All of Pontiac's '63 cars feature instrument panels with controls safely mounted in a cove for driver crash-protection.

Thinner-walled engines reduce weight. They also can bulge more. Pontiac's biggest engine for the new model year measures 421 cubic inches, up 11. Horsepower has climbed from a top of 348 to 370. Alternators are standard.

Pontiac's Tempest is equipped with the most muscular engine among U. S. compact cars—a V-8, it produces 260 hp. [See a following article.] It's an option.

The Tempest now comes in a sports-style, bucket-seated convertible version, and at 194.3 inches it is a full five inches longer in all its configurations.

The Tempest's rear swing axle, with its unique stern transmission, has been re-engineered to offer greater resistance to centrifugal forces on turns. Propeller shafts are beefed up.

Still another option: a tachometer.

Driving the new Grand Prix

When I went to Pontiac to pick up a Grand Prix, I wasn't expecting one with the 421-cu.-in. engine. But that's exactly what I got, so I couldn't resist starting my tests with the acceleration runs. The 0-60 run took 7.9 seconds, and 40-70 took 5.9 seconds.

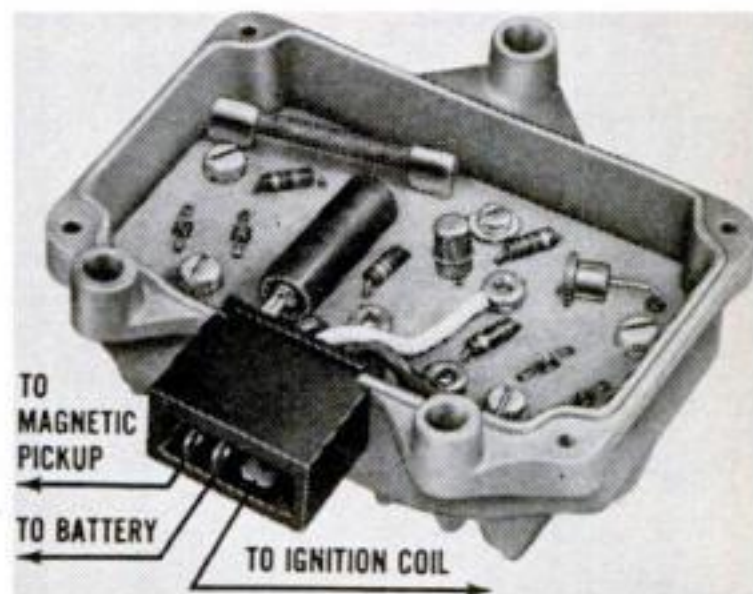
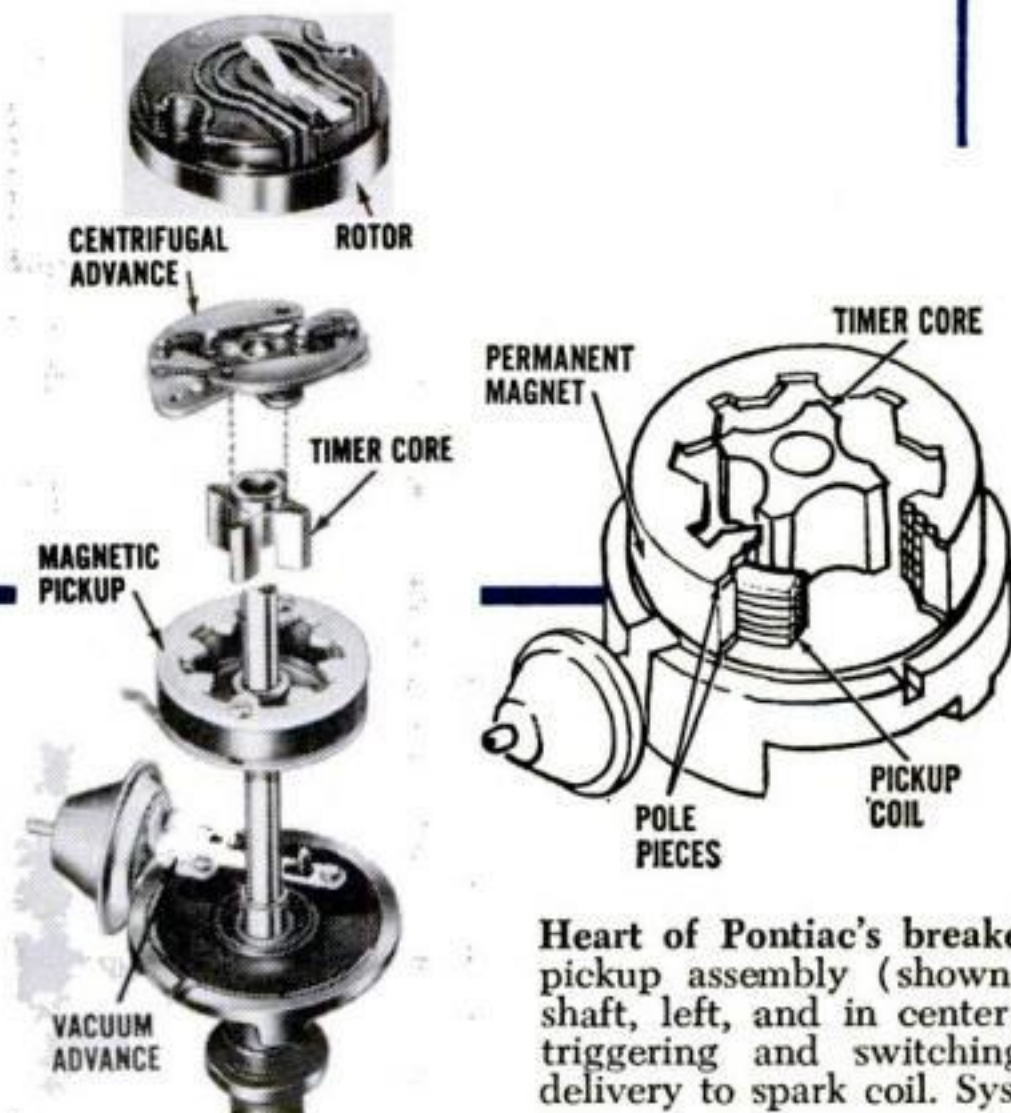
These figures, though impressive, don't compare with those of the 421 engine with a four-speed manual gearbox. Some months ago I tested this combo and polished off 0-60 in 6.1 seconds.

Why the big difference? The rear-axle ratios account for part of it. The slushbox runs a 3.08 rear end, the manual a 3.42. Also, the HydraMatic box was slipping. But this may be a fault only of this particular car—it had just undergone a long series of rugged hill-climbing tests. The brakes, too, had suffered from the tests; they were pulling to the right slightly. But this was a simple adjustment. I still believe those Pontiac aluminum drums are one of the best setups offered by the industry.

The suspension is typical of GM products—soft. But the car corners quite well. A mild understeer is evident, but not enough to cause serious trouble. Lean is minimal. Steering is as slow as a ferryboat; even with power assist it requires 4½ cranks lock-to-lock.

The horizontal speedometer (ugh) may please the stylists, but it can't be read as easily as a circular one. And there's that ridiculous floor-mounted tach again. And all those blinking idiot lights.

But the bucket seats are comfortable and, unlike most others from Detroit, they give a little lateral support. Head room, leg room, and hip room are better than average. If you want a real stormer that offers plenty of luxury, too, the Grand Prix is it.—A.M.



Heart of Pontiac's breakerless transistor ignition system is magnetic pickup assembly (shown mounted in exploded view of distributor shaft, left, and in center). It generates a timed pulse. This goes to triggering and switching transistors in control unit (right) for delivery to spark coil. System should last for the life of the car.

What's new at Buick

- a sleek, un-gewgawed model
- self-adjusting brakes
- alternators
- new heaters and air conditioners
- tilting steering wheels

The Buick story: Glamor

European simplicity in exterior style is combined with a driving compartment like an airliner's to produce the Riviera



Windows without frames were made possible by redesigning the Buick's outer door panels.

THE engineering departments and sales departments of automobile factories maintain a sort of armed truce. The engineers are coldly practical. The salesmen, bursting with adjectives, keep prodding the engineers to come up with something new to sell cars.

Last month Buick engineers brought out what, in their terse language, was a "two-door, four-window, pillarless coupe." The salesmen called it a "revolutionary, four-passenger sports hard-top."

Splitting the two descriptions down the middle produced an approximate truth. The spanking-new Buick Riviera was indeed what the engineers said it was; but, teamed with the stylists, they had produced something more—a glamorous, if unrevolutionary, vehicle. Like

What's new at Olds

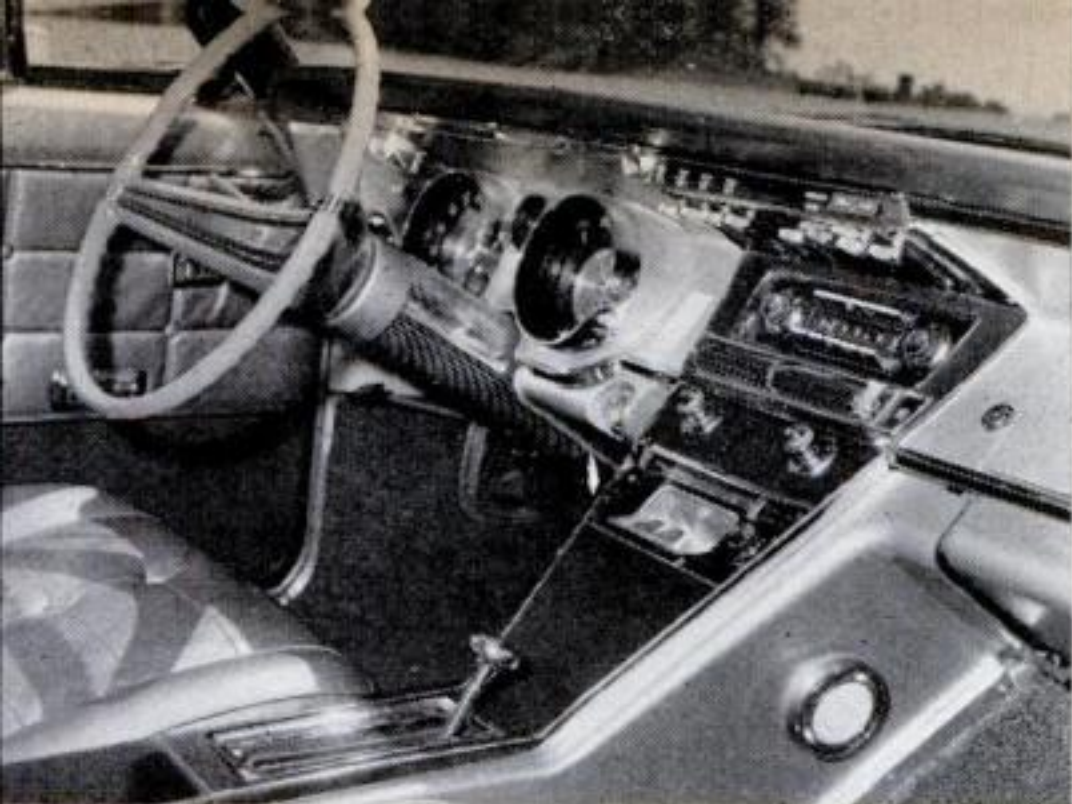
- new low maintenance
- self-adjusting brakes
- wheel-driven speedometer
- new sheet metal
- reduced turning diameter

Olds stretches oil periods

OLDSMOBILE cars now need undergo an engine oil change only each 6,000 miles. The oil-replacement period for '63 has been stretched an additional 2,000 miles. This low-maintenance item is added to lifetime lubrication for the differential and front undercarriage, excepting the steering linkage.

Clustered on dash at the driver's right are the heater, vent, and air-conditioning controls.





On console are controls for transmission, radio, and lights, plus ash tray and map box.

Pontiac's Grand Prix, the Riviera is designed to compete with Ford's Thunderbird.

Its lines are clean in the tradition of costly European cars, its sheet metal almost free of chrome gewgaws. It has four bucket seats. The Riviera's machinery is substantially that of the standard Buick's. Its engine, Buick's biggest, produces 340 horsepower.

On a wheelbase of 117 inches, the car is 208 inches long and 53 high.

All '63 Buicks have self-adjusting brakes, alternators, throw-away fuel filters, and batteries warranted for 36 months. Excepting the Special, all have new heaters less sensitive to car speeds, heaters and air conditioners in single-package combinations, optional cruise control, and tilting steering wheels.

All brakes are self-adjusting. Heretofore they were service-free only on powered units. To compensate for the added front-wheel weight when the engine was moved forward to reduce tunnel height, the timing-chain cover and water-pump housing are aluminum, not cast iron.

Turning diameters are down almost three feet, even though the cars are an inch-and-a-half longer. Fenders, hoods, doors, and deck-lid sheet metal are all new. For more accurate speedometer readings, the cable is run off the left front wheel, not the transmission.

Driving the new Riviera

If you haven't been behind the wheel of a Buick for four or five years, you'll doubly appreciate the Riviera. It handles better than any Buick that preceded it.

Of course, this staid 4,185-pound sedan wasn't meant to be thrown around turns, but I tried it just for fun. The front end ploughed noticeably and the tires screamed wildly—like banshees at a wake. But lean was moderate, and the abundant horsepower got me through the turns with a minimum of wrestling. The power-assisted steering is pleasantly fast for a car of this bulk; it requires about 3½ turns lock-to-lock.

The traditional Buick featherbed ride hasn't suffered. The worst ruts and bumps are ironed out completely. Road noise is practically nil.

The engine is a bear. It displaces 425 cubes and puts out 340 hp. Our test car had a double handicap: air conditioning and a mild cam left over from 1962. Even so, 0-60 and 40-70 times were 8.5 and 6.5 seconds respectively. Without refrigeration and with the new cam, these times would probably be pared down to about 7.8 and 6 flat.

The Turbine-Drive transmission is undoubtedly the smoothest automatic made. Brakes, too, are beyond reproach. Visibility is good except for a blind spot at the right rear caused by a fat roof pillar. But my big gripe is the instrumentation—or lack of it. The dash is a Milky Way of warning lights. And the tachometer is well hidden on the drive-shaft tunnel. With a slushbox, who needs a tach anyway?

An optional feature I wouldn't be without is the vertically adjustable steering column. It makes entry easier and allows the tilt of the steering wheel to be changed. Seats are comfortable, and leg room is good all around.—A.M.



Shades of yesteryear! Photo shows spindle on lugside of wheel, speedometer cable, and mounting. Installation is on inside of wheel.

What's new at Ford

- a new transmission
- horses, horses, horses!
- a transistorized ignition system
- more hardtops and wagons
- more sound insulation

The Ford stable: A clashfree, 3-speed box

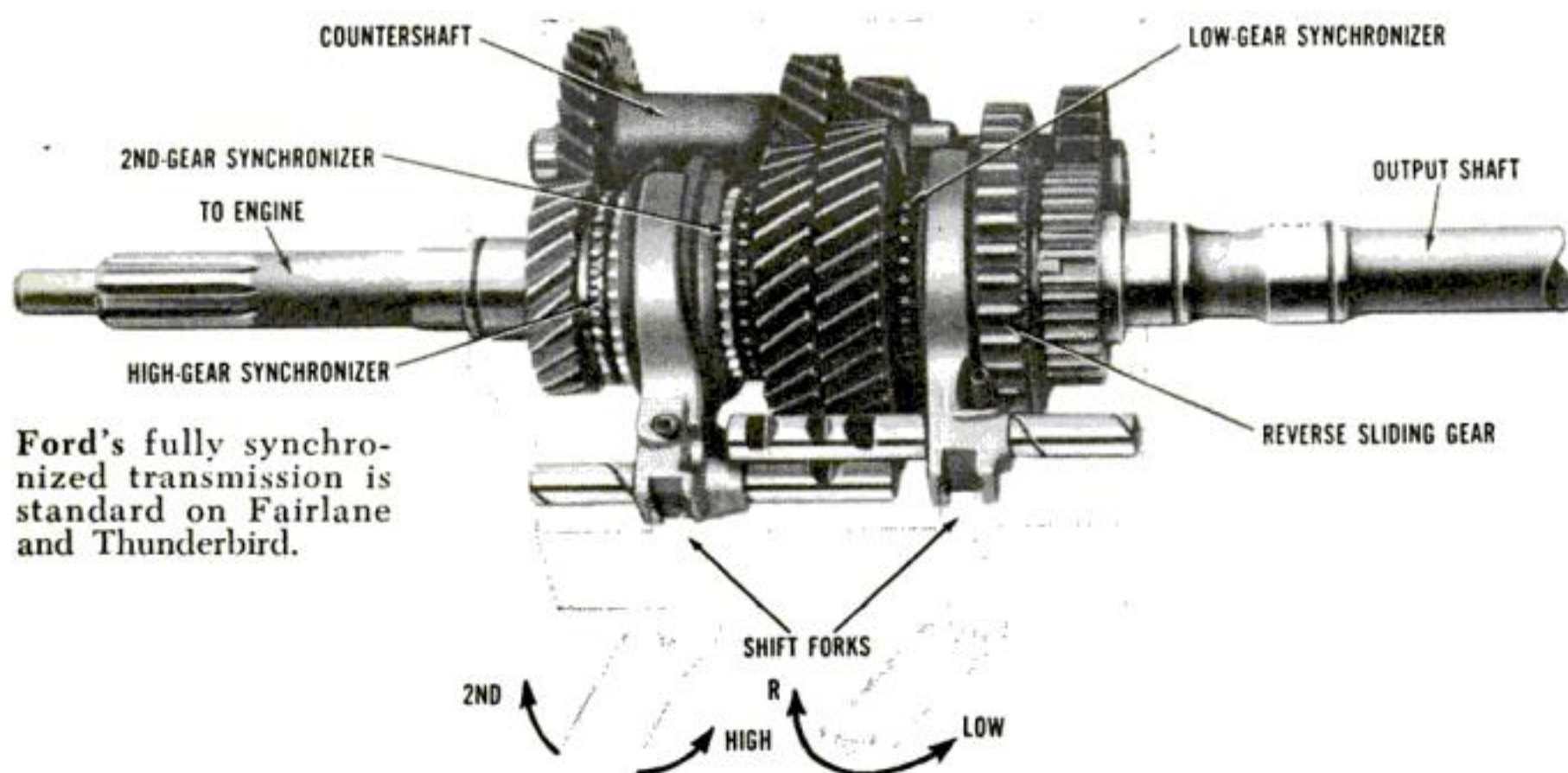
Eleven different horsepower ratings and eight axle ratios give the buyer a wide choice of combinations for performance or thrift

BACK in October, 1927, Cadillac announced a revolutionary development—a three-speed transmission that was clashfree in the second and third gears. It worked fine except for that first gear. Either you became an artist at double-clutching or you stopped the

car dead to get into low. Or you clashed.

Last month the Ford Division announced the first three-speed manual transmission in U.S. automotive history to be synchronized in all three gears.

Engineering a clashfree 3-speed was no trick. Ford merely sliced off one set



Driving the new Galaxie

The first impression I got of the Galaxie is that it was designed for professional basketball players and circus giants. Considering that it's a Ford, it's *big*. Gobs of front leg room and head room. The only squeeze play is in the rear; there, leg room is skimpy.

The bucket-type seats are well-padded and comfortable, and the range of adjustment is more than adequate. But lateral support is

nonexistent. They don't really enclose you.

Wide doors allow easy entry. Finish of the interior is excellent. But although the Merc Monterey—the Galaxie's opposite number—has switched to a full complement of gauges, the Galaxie still flashes idiot lights—for generator output and oil pressure—for woolgatherers. And I can't love the horizontal speedometer here, either!

How was the cornering? A wee bit scary until I got used to it. Lots of lean. Screaming

of gears from its fully synchronized 4-speed. But U.S. factories had never bothered with low, especially after the advent of automatic transmissions, because of manufacturing cost.

For 1963, Ford had other things to talk about, too. It published 11 different horsepower ratings for its engines. While this was two less than in 1962, it remained an impressive array, especially when combined with a buyer's choice of eight axle ratios. Mechanical changes ran into the dozens. By brands:

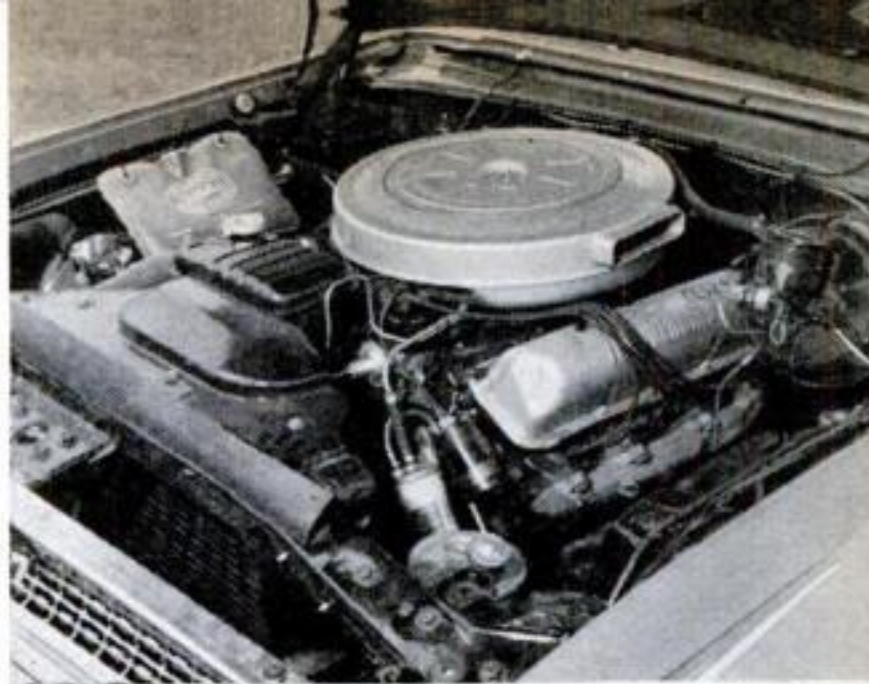
Galaxie The bread-and-butter car in the division's lineup, the Galaxie has a softened ride. Insulation under the hood and fenders, on the firewall, cowl, and floor pan, and in the rear-seat area dampens noise.

As in the Falcon [PS, Sept., p. 55], Galaxie engines—indeed, all Ford Motor engines—no longer require dealer inspection after the first 1,000 miles. The first oil change by the buyer: at 6,000 miles. Added to the considerable list of low-upkeep items is universal-joint lubrication good for 30,000 miles.

The Thunderbird's swing-away steering wheel is now a Galaxie option. So are a "reverberator" rear-seat speaker for stereophonic sound and an AM-FM radio.

Lustiest (405 hp.) and flossiest Galaxie is the 500 XL, with bucket seats and optional 4-on-the-floor transmission. That new synchronized 3-speed is available, too, as it is in the Fairlane. For the big engine: transistorized ignition.

The conventional, squared-off styling of the Galaxie's 209.9 inches bow to stern has been touched up.



Most muscular of Ford's engines, in Galaxie 500 XL, produces 405 hp. at 6,000 r.p.m.

Fairlane Two hardtops 13½ inches shorter than the Galaxie, and two wagons four inches longer than the sedans have been added to this line of middle-size Fords. An optional, rearward-facing third seat tucks under the floor when unused.

For all Ford engines, terminals are sealed on the voltage regulator to keep all-thumbs mechanics from shorting-out

[\[Continued on page 214\]](#)



Sole change in T-Bird's controls is removal of power-window buttons from doors to console.

tires. Surprisingly, in view of all the rumpus, the car sticks well to the road. I soon found myself relaxing while cottontailing through the corners at a respectable clip.

But ride is this car's best feature. The new suspension incorporates, besides the conventional up-and-down cushioning, a slight amount of horizontal give. Minor road irregularities such as tar strips—usually a problem with all but the most gooey suspensions—are damped beautifully. Yet the suspension is firm enough

to soak up the worst potholes with no pitching. The cabin is well insulated from road noise and engine vibration.

And no complaints on performance. Of course, the 500 XL that I drove—with 406-inch engine, four-speed gearbox, and 4.11 axle—wasn't exactly typical. My 0-60 run took a short 7.3 seconds. Then I ran it up to 100 from a standing start. Time: 17.4. It's in the upper speed ranges that this engine really comes on.—A.M.

What's new at Chrysler

- industry's first long-term guarantee
- drastic restyling
- horses, horses, horses!
- Valiant, Dart convertibles
- vacuum-operated parking brake

Guaranteed: 50,000 miles

Chrysler adds to its list of low-maintenance items a stunning warranty on engines and drive trains—if you abide by the rules



Valiant—as well as Dart—has returned to single headlights.

IN the last couple of years the U. S. motorist has been treated to a shocking extravagance by the factories that make his automobiles. The old 90-day guarantee on parts, as sacred to the industry as the extra cost for heaters and

radios, has given way to a 12-month, or 12,000 mile, warranty.

Last month the Chrysler Corp., in a spectacular gesture of confidence in its products, raised the ante. Not by one year, not by two years, but to a full five years, or 50,000 miles, whichever comes first.

The warranty applies, of course, only to engines and drive trains. Specifically, the company will pay for the parts and labor if the head or pan of an engine has to be removed, or if transmission, propeller shaft, or rear axle must be disassembled.

There *are* provisos. Spark plugs are

Driving the new Dart

There's a good reason why I saved my road test of the Dart GT for last. It's a car I feel at home in. Yet I wouldn't unqualifiedly recommend it for everyone.

Need a car large enough to ferry a small family to Aunt Millie's every Sunday? Want good handling and firm, fast cornering? Unwilling to put up with the shaky parts and service facilities of many foreign jobs? The Dart is for you.

Of course if you have a sensitive seat, buy General Motors or Ford. The Dart suspension is a bit softer than that of the torsion-bar Dodges of a couple of years ago, but it's still firm by Detroit standards. This can actually improve the ride on a really bad road; no pitching or bottoming. But on smooth roads, small irregularities are more readily felt.

I strongly recommend the power-steering option. It gives good road feel, allows easy parking, and, more important, provides faster steering (3½ turns lock-to-lock).

All controls are easy to reach except for the hand brake—that's hidden under the dash to the left of the steering column. Visibility is good except in the right rear, where a roof pillar gets in the way.

Head room is good, front leg room better than average, rear leg room barely adequate.

A handy feature is the glove-box lid with two indentations for holding cups or glasses.

Brakes are good in spite of those kiddy-car 13-inch wheels. Performance is okay. With the 225-inch engine, TorqueFlite box, and 2.93 rear end, I got 0-60 and 40-70 times of 12.9 and 14.0 seconds without manually shifting through the buttons. If you want more, see your friendly Mopar dealer about his speed options.—A.M.



Parking control locks Imperial's transmission. A round steering wheel is optional.

not covered. Neither are accessories such as batteries.

And—buyer take note, this is where Chrysler really lays down the law—a car owner must return his vehicle to the dealer for maintenance every 4,000 miles, or every two months, whichever comes first. Otherwise, the warranty is void.

But Chrysler even sweetens that—the guarantee is transferable, owner to owner. The guarantee follows by only a year an impressive expansion of the company's list of low-maintenance items.

Stylists have a field day. Biggest changes in Chrysler cars for '63 are in the bodywork. Except for the Imperial, all have new metal from

[\[Continued on page 218\]](#)



Extra appointments inside Plymouth Sport Fury include console. Available: a tach.

What's new at Lincoln-Mercury

- a bulging engine
- alternators, tachometers
- compact convertibles
- different pistons, carburetors
- new sound insulation

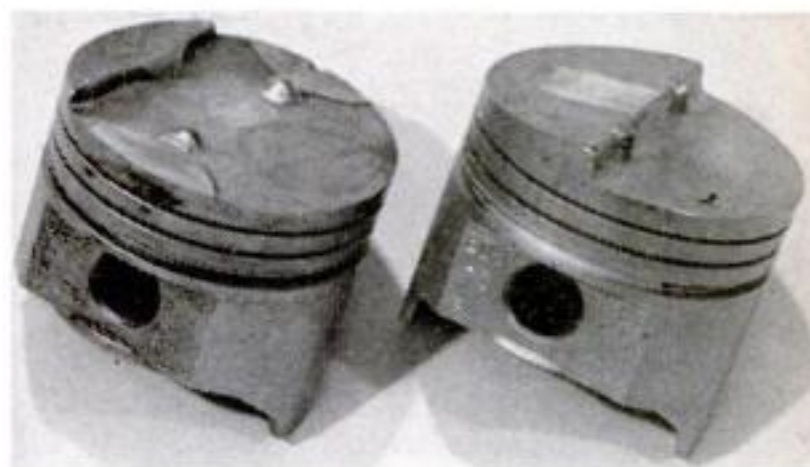
For Mercury: Zoom!

THE Ford Motor Co.'s Mercury Monterey nudged the Ford Motor Co.'s Galaxie last month and muttered darkly, "Move over." For 1963, the Monterey had advanced into the same major power league, with an engine of 405 horses—with transistorized ignition—that almost bulged the hood.

There were other engine options, but Mercury plainly was courting customers who liked the bouquet of scorched rubber when the accelerator was floored. A six-cylinder engine and a V-8 of 292 cubic inches are summarily abandoned in the new model year. Standard now is a 390-inch engine that, depending on the compression ratio and carburetion, pumps out from 250 to 300 horsepower.

Like the other three cars of Ford's Lincoln-Mercury Division—Comet, Meteor, and Lincoln Continental—the Monterey included other appetizing tidbits in its announcements. Road,

[\[Continued on page 192\]](#)



For better combustion, Continental swaps old piston (left) for half-wedge-top type.

What's new in engines

- a smaller, lighter block producing more power
- thinner walls, shorter exhaust passages
- high thermal and mechanical efficiency
- more main bearings
- a lot of horsepower at a lower price

New engines: Chevy, Tempest

For entirely different reasons—at least one will surprise you—two companies offer better power plants in the new model year

TWO new engines provide muscle for two brands of cars in the 1963 crop announced last month, and their displacement and power are in sharp contrast. So are the reasons for their appearance.

One of the engines was designed by Chevrolet for its standard car, the other by Pontiac for its compact Tempest. The Chevrolet engine, an in-line six, is of modest proportions and power. The Pontiac engine, a V-8, is husky and boisterous.

Chevrolet veteran. Chevrolet produced its new engine simply because its old, in-line overhead-valve six was obsolete. It had a right to be. Its grandpappy first powered a Chevrolet in 1929, when this GM division switched from four to six cylinders. That first six had a piston displacement of 194 cubic inches and produced 46 horsepower.

A lot of things happened to it in the next 33 years. Now and then it underwent minor surgery. In 1937, in a burst of generosity, Chevy gave it another main bearing—for a total of four. Every so often it got new cylinder heads. The holes for the pistons grew little by little.

This is the way the cubage and horsepower went up:

YEAR	CU. IN.	HP.
1933	207	65
1937	216	85
1950	235.5	105
1953	235.5	115
1954	235.5	125
1955	235.5	135

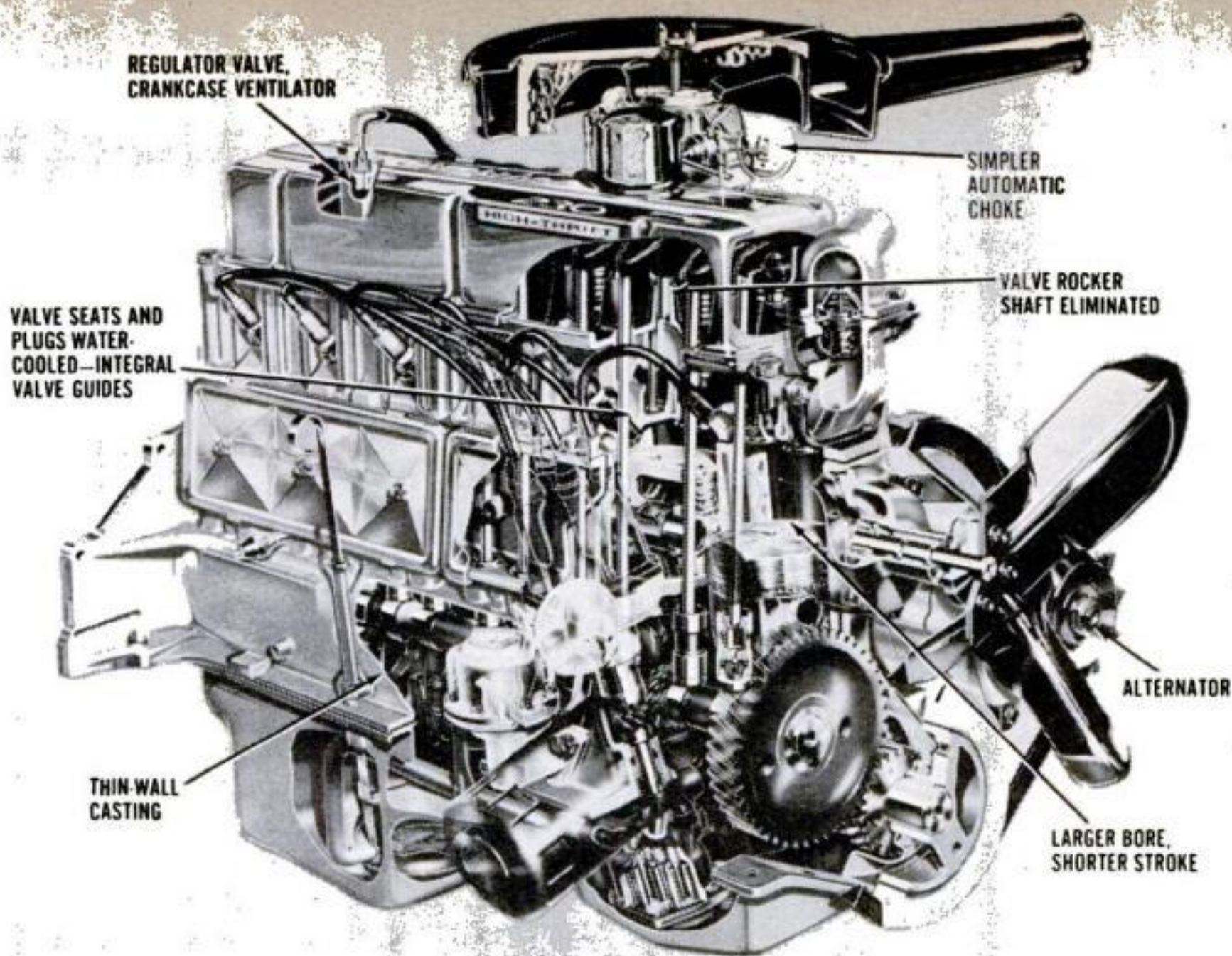
It was in 1953 that the Chevy six, still lubed by the bucket-and-splash system it had been born with, was extended a gesture of affection by the company for its noble service. It was given a pressure oiling system.

When, last August, the last of the old Chevy sixes rolled off the production line, the basic engine—for all the refinements it had undergone—was still, as far as design went, the 1929 engine. In more than three decades it had propelled 23,700,000 cars, not to mention uncounted tens of thousands of motor trucks, at least 1,185,000,000,000 miles.

The new six. The replacement for the old engine is of exactly the same type, but smaller. It weighs only three-fourths as much, yet produces more power. (See comparison box.) The “dry” weight of

How Chevy's new and old sixes compare

	1963	1962
Type	OHV.....	OHV
Displacement (cu. in.)	230.....	235.5
Bore & stroke (in.).....	3.56 x 3.25...	3.56 x 3.94
Comp. ratio (:1).....	8.5.....	8.25
Hp. (@ r.p.m.).....	140 @ 4400	135 @ 4000
Torque (lb.-ft.)	220 @ 1600	217 @ 2400
Fuel	Reg.	Reg.
Main bearings	7.....	4
Max. journal dia. (in.)	2.3.....	2.77
Max. journal length (in.)	.76.....	1.18
Piston weight (oz.)	17.6.....	18.88
Con-rod weight (oz.)	20.8.....	28
Firing order	1-5-3-6-2-4..	1-5-3-2-4-6
Lubrication	Pressure.....	Pressure
Oil capacity (qt.)	4.....	5
Oil change (miles)	6,000.....	4,000



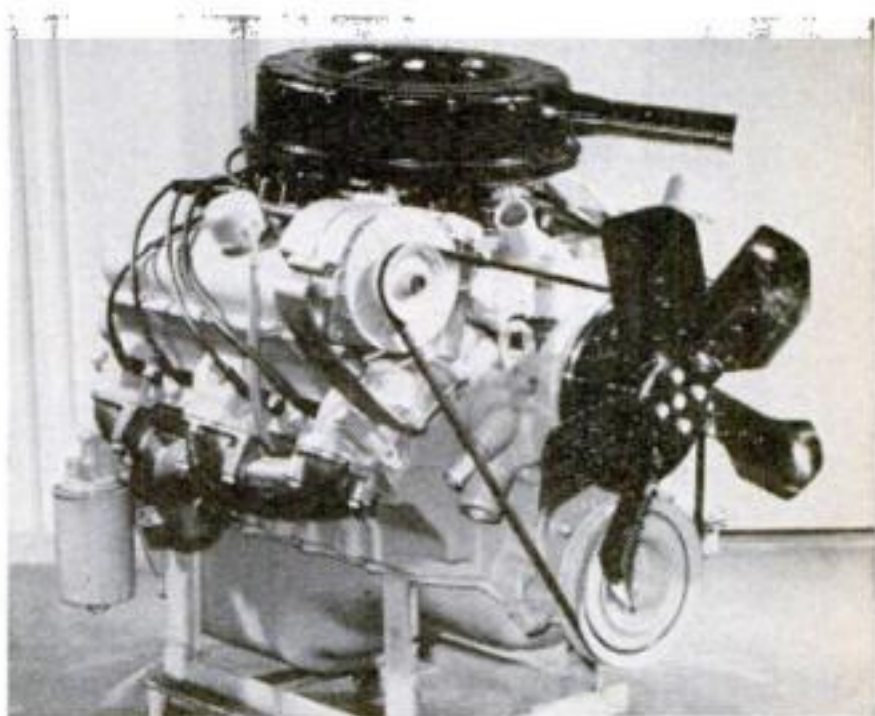
In Chevy's new in-line six, inches lower and shorter, each crankshaft throw has two main-bearing supports

the old engine—that is, without oil or water, but with all its accessories—was 608 pounds. That of the new engine is only 465 pounds.

New foundry techniques give its cast-iron block thinner walls. The exhaust passages are short. That exposes a minimum of their area to the cooling engine water, and that is largely responsible for what the engineers term the “low heat-rejection” characteristic of the new power plant. Lost heat is lost energy. If an engine spews less of its heat into the radiator water, the motorist gets more go from his fuel.

In the new engine less exhaust heat is transferred to the water that jackets its block. The engine, therefore, has to reject less heat through its radiator. The radiator can be smaller—that for the old engine held 18 quarts of water (with heater), that for the new one only 12.

The old engine, in yesteryear's tradi-



Tempest engine is an extra-cost option on all Pontiac's compact models. Rods, valves, cams, manifolds are the same as in 389-inch engine. Heads compensate for varying grades of fuel.

tion, had a small bore, long stroke for high thermal efficiency (use of fuel energy) but poor mechanical efficiency (friction). The new one, “oversquare,”

[\[Continued on page 216\]](#)

What's new at Rambler

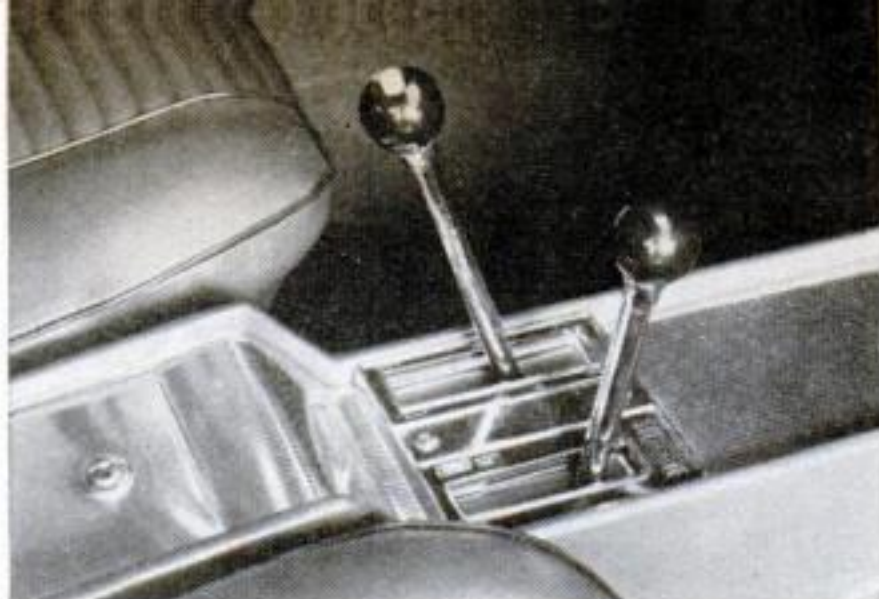
- floor-mounted overdrive control
- new gear ratio
- more power

Little Rambler: 2 shift sticks

THE plushiest of the Rambler Americans, with bucket seats and a console, has a brace of floor-mounted sticks that look for all the world like those in a 4-wheel-drive Jeep. They're not. One



Decorative chrome spruces up the convertible.



With overdrive "in," kickdown to a lower gear is made by pressing button on main shift lever.

works a conventional transmission, the other an overdrive control.

When the second lever is back, OD is in. When it's forward, it's out.

A chrome plate at the base of the gear-shift identifies the positions. A signal light tells when the OD is operating.

The second-gear ratio is changed from 1.63:1 to 1.906 for better spacing. The standard "E-stick" and automatic transmissions are not floor-mounted. Available: 138 hp. as well as 90 and 125.

The company will announce its Classic and Ambassador models this month.

What's new at Studebaker

- optional supercharging on all cars
- optional disk brakes in front
- sun roof on station wagon

Studebaker: "Blown" engines

STUDEBAKER sprang an impressive dossier of surprises for '63. By item:

The engine supercharger on the sporty Avanti [PS, June '62, p. 55] is an option on all Studebaker models.

The Avanti's front disk brakes ditto. The braking system incorporates as standard the split main reservoir—like Cadillac's and Rambler's—so that complete hydraulic brake failure is almost impossible. Brakes are self-adjusting.

Station wagons have sun roofs.

Larks and Hawks have alternators.

Cheers!—oil-pressure and amp gauges



Cruiser has new side moldings, tail lights.

read direct. Gone are those idiot lights.

Optional with all V-8 engines is a floor-mounted, 4-speed manual box.

New rear shocks have larger insulators and a bayonet-type mounting to minimize noise transfer to the car body.

A viscous drive to slow down the fan and save engine power as road speed goes up is standard on all supercharged engines, optional on V-8s.

The Cruiser is now on its own—it's no longer the Lark Cruiser, just plain Studebaker Cruiser. This telegraphs some important changes for 1964.

The front-pillar dogleg is no more. Parallel-sweep wipers overlap.

Space-age garb of pure gold

Protective suits coated with 24-carat gold are the latest thing for men handling rocket and missile fuels.

The gold will withstand flash temperatures up to 3,000 degrees, sustained heat of 500 degrees (enough to broil a steak); is impervious to most chemicals, including liquid fluorine, nitrogen, hydrogen, oxygen, and exotic rocket fuels. The coated fabric reflects 75 percent of applied heat, half again as much as aluminum.

Snyder Mfg. Co., New Philadelphia, Ohio, makes the coveralls out of DuPont Armalon, a metalized plastic film laminated to a woven-plastic lining. The gold is applied by vaporizing it in a vacuum. When zippered, the suit is airtight. Breathing air comes through a hose or from a back pack that also contains a two-way radio.



Lights! Camera! Detective plays suspect as police put lineup on ultra-high-frequency TV.



Unscrambler on lower receiver clears picture, makes closed-circuit transmission unnecessary.

Police lineup gets TV tryout

With a detective acting the part of a prisoner, the New York City police department here puts on its first lineup show on a "locked" television circuit. After the

detective went off the air, 18 suspects were questioned before the TV camera for real. Their pictures were scrambled in the telecast so they could be received only in other city police stations having official sets equipped with unscrambling devices.



Independence Hall comes ablaze with brilliant light to climax the dramatic story of the Liberty Bell

Light-and-sound drama brings history to life

Muted music . . . lights up . . . a voice: "Let it ring! Let it ring!"

Electronic echoes of the Liberty Bell fill Philadelphia's Independence Square. Stirring music surges. Independence Hall blazes into a glory of light: The Declaration of Independence has been adopted.

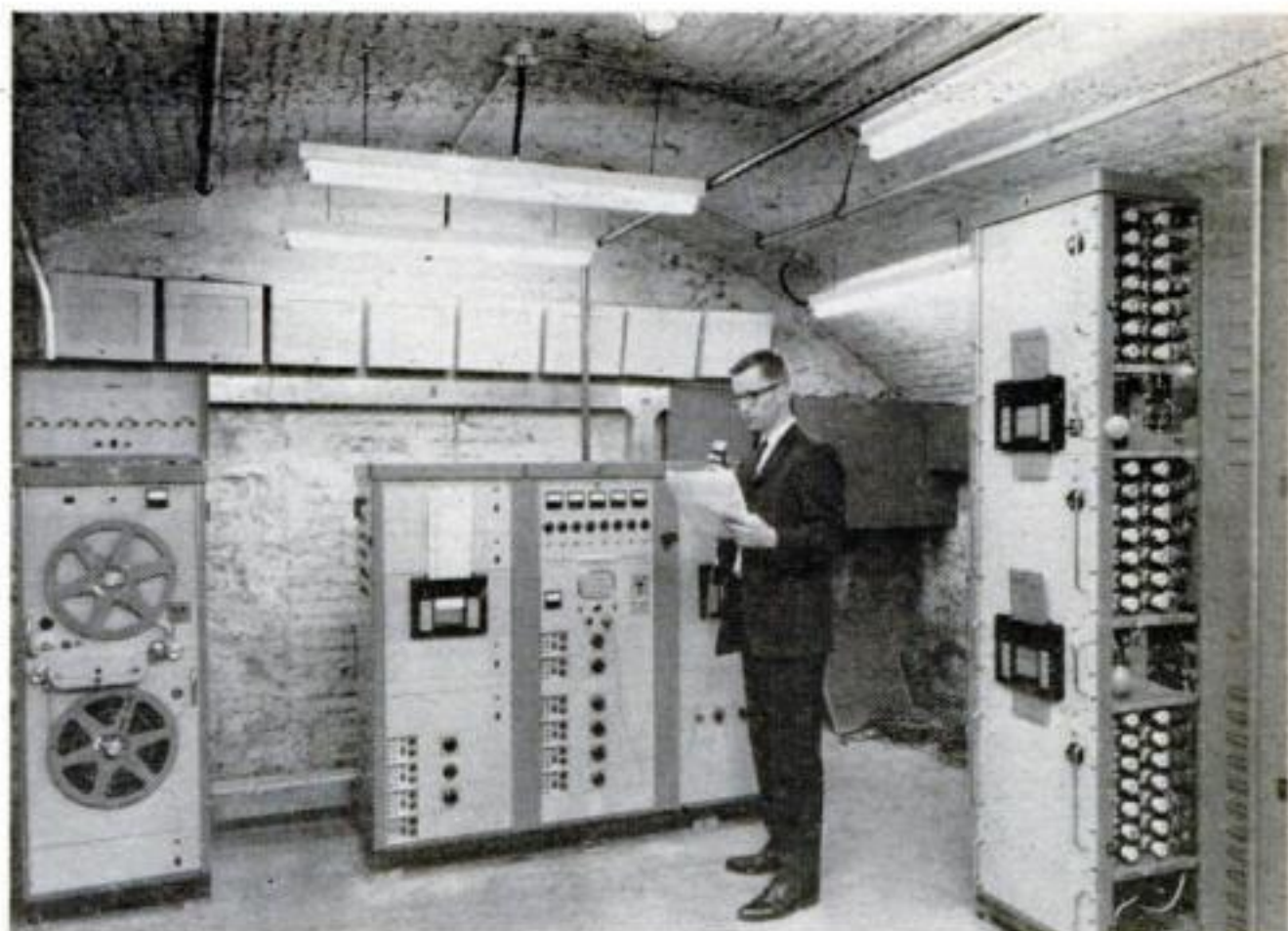
So ends a performance of Lumadrama, bringing to vivid life the story of the Liberty Bell and the birth of our nation on July 4, 1776—the first presentation in the

United States of a theatrical technique developed in France. Known there as *Son et Lumiere* (sound and light), it has been used to recreate many outstanding events from the past at historic sites in Europe.

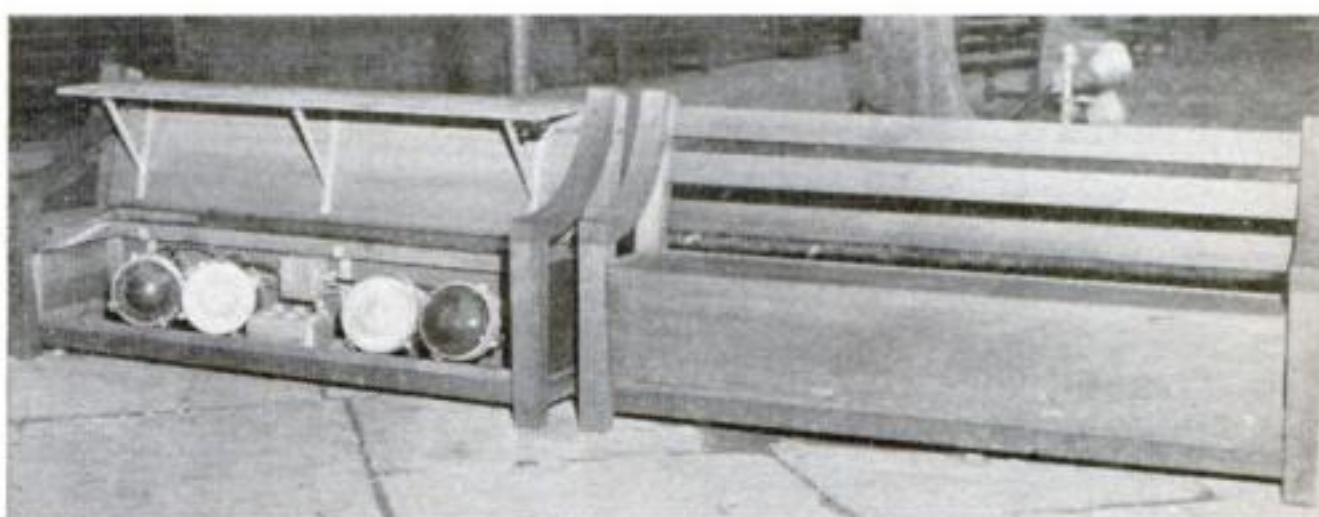
The drama of the Colonies has no live actors but is taped, electronically cued to a script written by Pulitzer Prize poet Archibald MacLeish. The story of our country's struggle for freedom is narrated by Fredric March. There are the voices



and a new nation born.



Electronic components for Lumadrama are housed in a domed, brick-walled vault under the west wing of Independence Hall. A 10-channel hi-fi magnetic-tape system reproduces music, narration, sound effects, dialogue—and controls the lighting effects. Punch card (center) drops down automatically to cue electronic circuits for proper time sequence. An engineer, following a cued script, can correct any mishaps, make spot announcements. The special sound and lighting equipment for the presentation was designed by North American Philips Co.



Batteries of floodlights, remote-controlled, are hidden inside special red-wood benches that are opened for night performances. Closed (right) in the daytime, they serve as ordinary seats for visitors.

of George Washington, Thomas Jefferson, Benjamin Franklin, and Thomas Paine, impersonated by other actors.

A dramatic effect of movement is created by various combinations of colored outdoor floodlights and spotlights inside the building (switching from room to room as the scene of activity changes). The illumination, synchronized with stereophonic speakers strategically placed around Independence Square and inside Independence Hall, gives a sense of action as the past is relived through the voices of patriots.

The scratching of a pen is heard as Washington voices a wistful letter he is

writing to his wife, Martha; the voice of Jefferson rings as he reads the Declaration of Independence to the acclaim of his fellow citizens. A musical accompaniment, written by David Amram, is played by the Philadelphia Orchestra.

The after-dark spectacle goes on twice nightly (weather permitting) in Independence Square. It will continue through October, and be repeated next summer.

A similar pageant of light and sound is dramatizing the colorful history of the oldest city in the United States—St. Augustine, Fla. Both productions are under the supervision of the National Park Service.

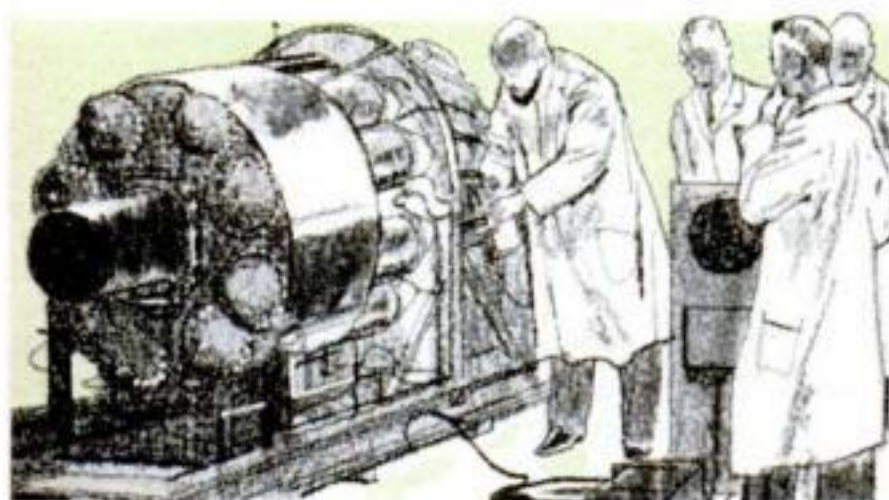
How the First U.S. Jet Was Born

... 20 years ago this month



September, 1941: "Build 'em!"

In Washington, Hap Arnold called a top-secret meeting of Air Corps officers and several engineers. He walked to his safe, worked the dial, removed a roll of drawings: "Gentlemen, I give you the Whittle engine. Consult all you wish . . . Build 15 of them." General Electric's R. C. Muir said his company would. Machine tools and carefully screened workers (many never knew what they were building) were moved to GE's River Works at Lynn, Mass.



May, 1942: U.S. engine fires

Working with Whittle and his engine, Americans designed and built the first U.S. jet engine in an incredibly short seven months. On May 21, 1942, nine engineers gathered to see if it would work. The starter was pressed. There was no fuel pressure. A pair of pliers corrected a faulty relief valve. The engine ran! Men toiled 14 hours a day as they prepared two engines scheduled to go into the first U.S. jet plane, the Bell XP-59 Airacomet.

IN JANUARY, 1941, U.S. Army intelligence put together many fragments of information to reach a conclusion that caused sleepless nights: The Germans, having lost the Battle of Britain the previous summer with propeller planes, were working on a new kind of propulsion.

In April, General Henry H. (Hap) Arnold, head of the Army Air Corps, visited England. He was startled to learn that the British had a twin-engine



October, 1941: British import

Three mysterious packages in unmarked trucks reached the plant by roundabout routes from Boston airport. They contained a British jet engine like the two that had got the Gloster E 28/39 aloft. (This engine is now in the National Museum, Washington.) A bearded stranger, calling himself Frank Whitely, came to stay at the home of a GE executive. It was months before the GE man's wife learned she had been hostess to jet inventor Frank Whittle.



August, 1942: On to Buffalo

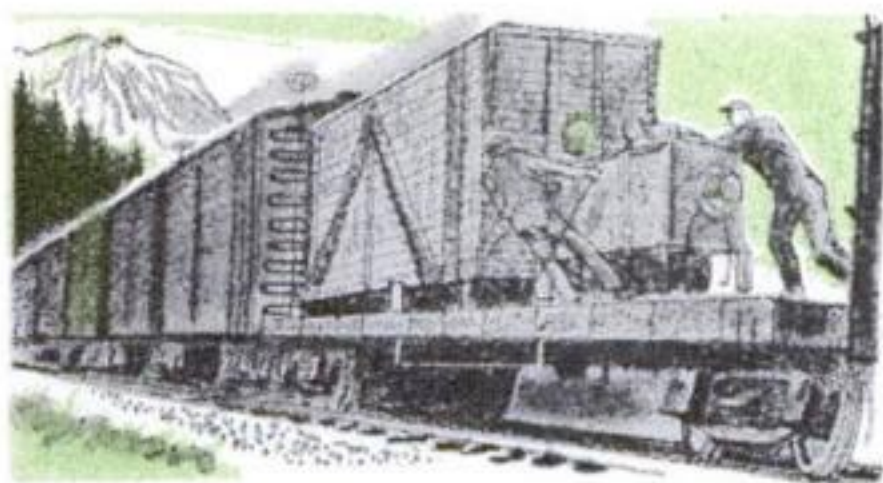
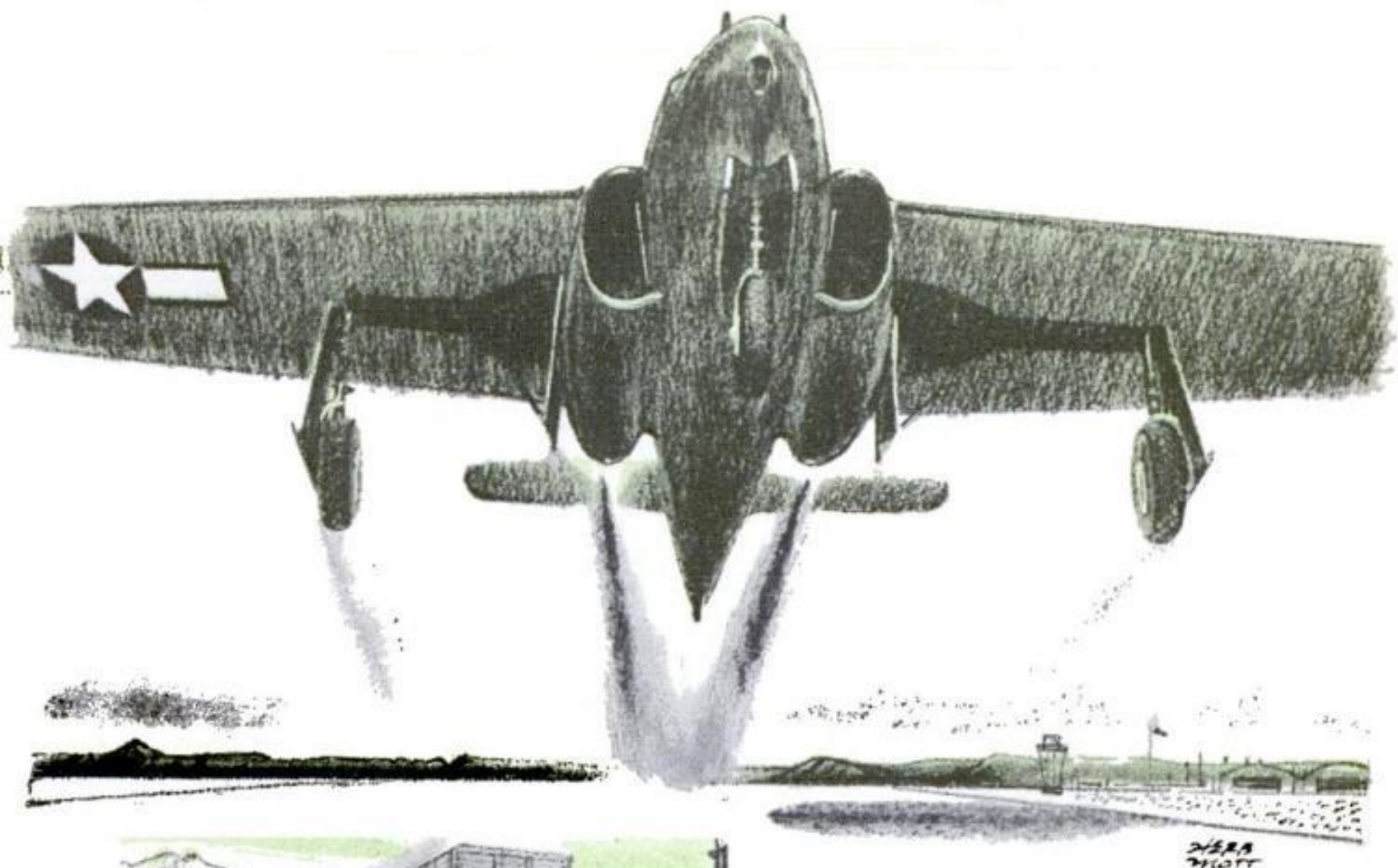
The two engines, with 1,150 pounds of thrust each, labeled "superchargers," were loaded into a boxcar at Boston's South Station. Next morning they reached Buffalo, N.Y., and the plane they would power. The XP-59, 38 feet long, 45 feet in wingspan, had a high tail to clear the jet wake so gases from the engine would do no harm. A midwing monoplane, the XP-59 had tricycle landing gear, weighed about 11,000 pounds, had twin 35mm cannon.

jet, the Gloster E 28/39, ready to fly. The world's first jet, the plane did fly May 15. Its engines, the invention of Royal Air Force Group Captain Frank Whittle, then 35, were the first radical change in airplane power since the Wright brothers' original flight in 1903.

To get jet power for the U.S., Arnold moved fast. He had an American engineer, D. Roy Shoultz, look over the Gloster plane and Whittle's engine, and bring back in his mind all the informa-

tion he could. (Shoultz, because his plane would land in spy-infested Portugal, was forbidden to carry any documents.) Then the British secretly sent Arnold plans of the Whittle engine.

Arnold now set in motion the chain of events that produced, just 20 years ago this month, the United States' first jet. Because the story was at the time a military secret, reported by no newspapers, it has never become widely known. This is how it happened.—*Gardner Soule*.



September, 1942: Cross-country

Its engines mounted on the fuselage, XP-59 was shipped on a flatcar to California. The wings were crated separately. Two GE men and four AAF men escorting the plane lived in a mail car, cooking on a Sterno stove. During the trip the engines had to be rotated at 400 r.p.m. by a heavy air compressor (to keep the bearings oil-coated). Once the compressor worked loose. The men struggled to lash it down while the train rocked along at 60 m.p.h.

October, 1942: First flight

Later, a car containing high explosive was hooked onto the car carrying XP-59. GE men protested, got it uncoupled. At Muroc Bombing and Gunnery Range, Calif., plane was reassembled. (Muroc is now Edwards Air Force Base, home of X-15.) On October 2, Test Pilot Bob Stanley taxied out the XP-59. He turned at end of runway, tested engines. Then he took off with, GE's Theodore J. Rogers remembers, "a roar like a blowtorch and a smell of kerosene." He flew only 100 feet high, but next day he climbed to 10,000 feet, flew at 350 m.p.h. The British (using Gloster Meteors against buzz bombs) and the Germans (Messerschmitt 262s) both flew jets in World War II. The U.S. did not. But the flight of the first U.S. jet led directly to all jet planes of today, and to the U.S. becoming the world's largest producer of jet engines. It may lead to 3,300-m.p.h. planes. Engineers think the jet is potentially capable of that speed.

Terrible Terrain? It's Easy with

By V. Lee Oertle

FROM three to six puffy little wheels sprout out anywhere on them. Their tiny power plants sound like a corn popper gone awry. They scoot through thickets, over sand dunes, and across rock-strewn fields. When you

first see one of these unlikely looking vehicles, miles from civilization, it's easy to picture its driver pulling up and asking to be taken to your leader.

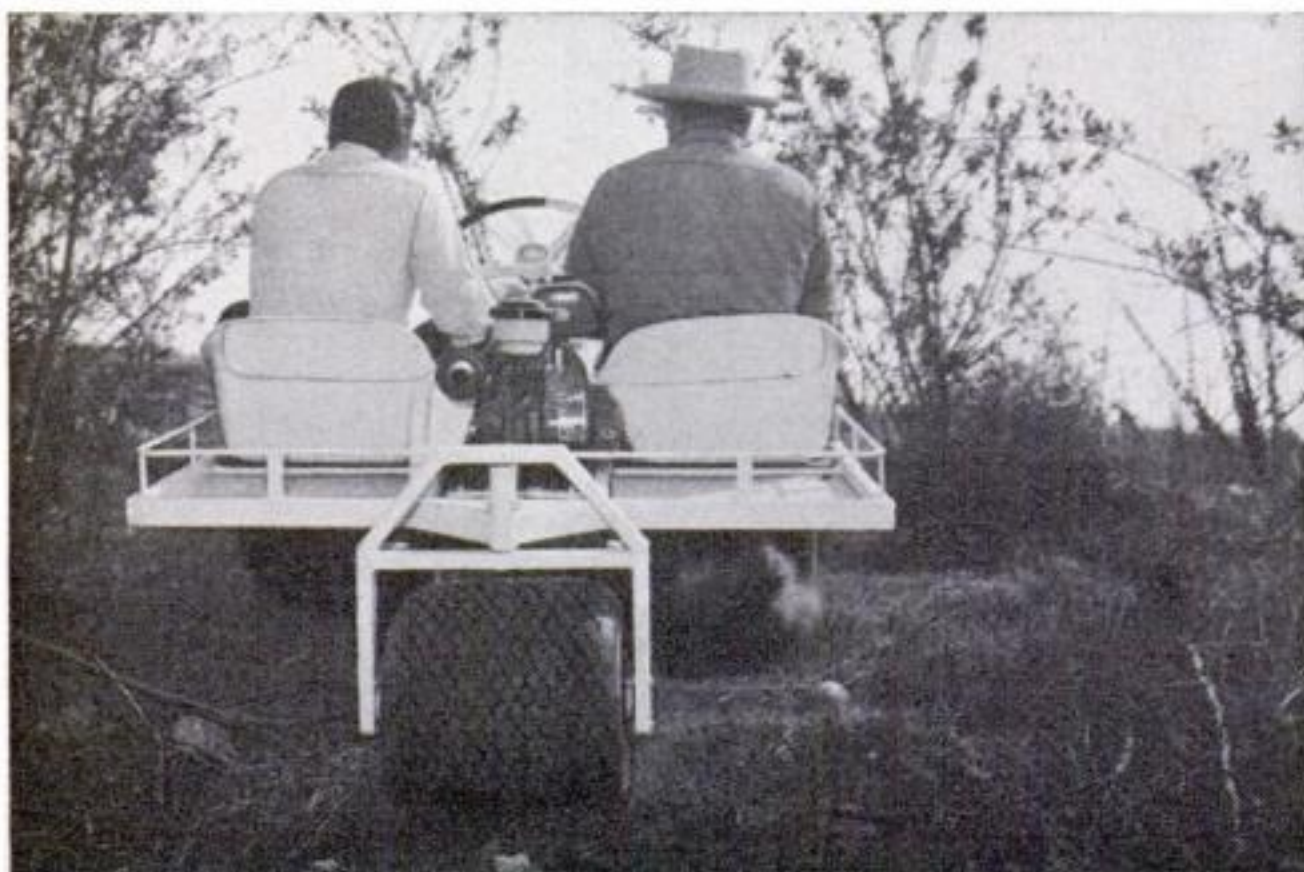
At least five of these go-anywhere machines have hit the market recently. Thanks to their high-flotation Goodyear Terra Tires—inflated to only two p.s.i.—

Mud, snow, sand, rocks—they're all the same to these puffy-wheeled little vehicles.



Terra Gator

Full fiber-glass body allows Terra Gator to cross water with help of rear pump jet. On land, it's steered by switching power from one side to the other. A single stick controls speed and direction.



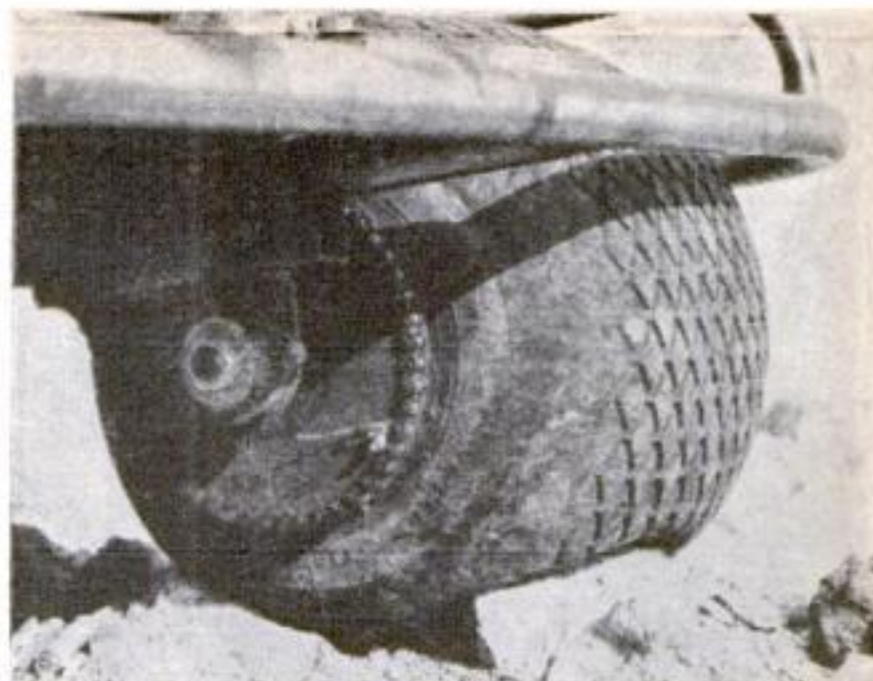
Terra Kart

With its 52-inch wheel-base, Terra Kart offers excellent maneuverability. But low engine power restricts its use to flat terrain. Rear wheel steers through cables and pulleys. The contoured bucket seats are of molded fiber-glass.

Terra Tires

they travel over rough terrain like a scalded goat.

All five shown here use air-cooled four-cycle engines. Two of the vehicles steer from a single front wheel, one from a single rear wheel, and one by alternating power from side to side like a crawler tractor. Top speed is from



Sharp rocks don't damage Terra Tires; low pressure allows tires to wrap around obstacles. The two-ply nylons are standard equipment on all five vehicles. They come in many sizes, including giant ones for commercial vehicles.

They just keep chugging along

Desert Rat

One of the first of these go - anywhere wagons, Desert Rat has been completely redesigned in this model. The four-wheeler drives through rear wheels. Center steering places column between seats.



Maverick

Powdery snow is no problem for the Maverick—though chains would give better grip in snow-climbing. Straight - through rear axle is live, driven by double chain. Joy stick provides acceleration (push), braking (pull).





Sidewinder. Well suited for loose sand, it also runs in 16-inch-deep water—if driver doesn't

mind getting wet. It carries up to five on level ground. Tiller steers the front wheel.

15-25 m.p.h. Prices range from \$550 to \$995.

The vehicles are used for both work and play—for hunting, fishing, rock collecting, fence-line scouting, hauling irri-

gation pipe over farm fields, even for transporting golfers.

They're small enough to fit in the bed of a pickup truck. Some can even be carried in a station wagon. ■ ■

How the Terra-Tire vehicles stack up

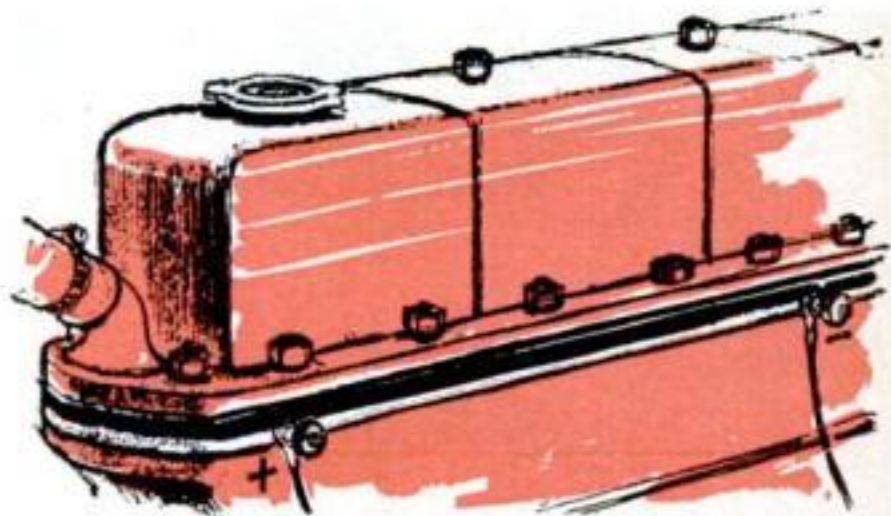
	Engine Horsepower	Weight (pounds)	Length (inches)	Width (inches)	Height (inches)	Tire Size	Number of Wheels	Seating Capacity	Transmission	Price	Address of Manufacturer
Sidewinder	7 or 9	285	80	60	33	16 x 12	3	3	drive chains (three-speed gearbox optional)	\$695	P.O. Box 814 Glendora, Calif.
Desert Rat	7	330	86½	48	38	16 x 15	4	2	variable-speed pulley	\$995	RAT Corp. Box 1760 Santa Ana, Calif.
Terra Kart	4	250	Not avail- able	52	38	16 x 15	3	2	variable-speed pulley	\$910	DuBay Terra Kart 12671 Nelson St. Garden Grove, Calif.
Terra Gator	9	350	70	49	34	16 x 12	6	2	torque converter	\$995	Andy Stewart Inc. 1710 Potrero St. El Monte, Calif.
Maverick	5½	250	76	57	30	16 x 12	3	2	centrifugal clutch	\$595	Bug Engineering 330 S. Irwindale Azusa, Calif.

"I'd like to see them make..."

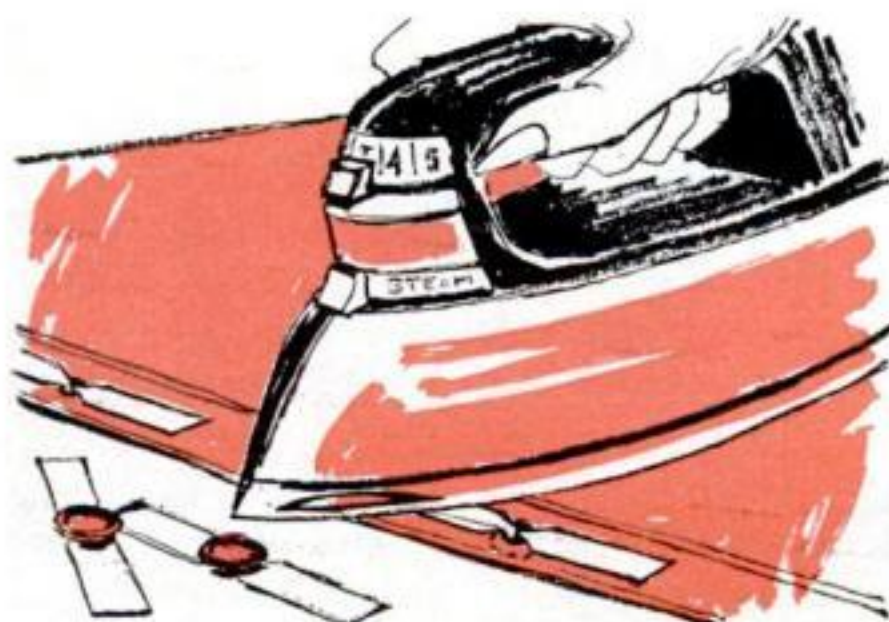
Postage meters on street-corner mailboxes so you could "stamp" a four-cent letter by dropping in a coin. Large boxes might have a postcard dispenser on them, too.—*Lon Calhoun, Phoenix.*



A quick-locking dog collar to eliminate the struggle to put it on. The fastener would slide together and lock as some belt buckles do.—*Clark Thompson, Corona del Mar, Calif.*



Asbestos cylinder gaskets with thermocouples to supplement car generators. Hot junction would point to cylinder, cold junction to water hole.—*J. V. S. Murty, Visakha Patnam, India.*



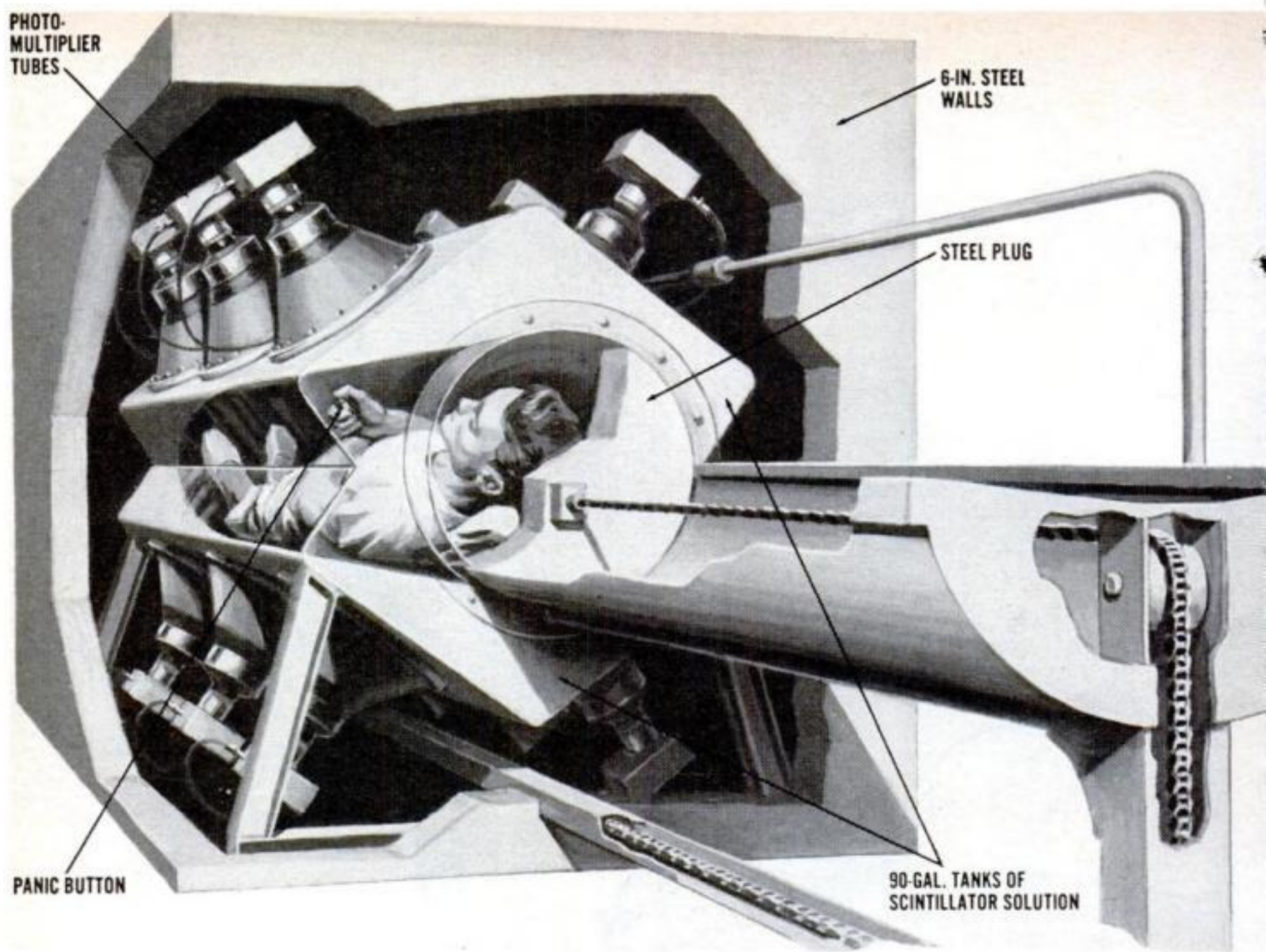
Iron-on buttons for clothing. Adhesive tabs on the back would slip through grommet holes. When ironed flat, they'd be waterproof and unaffected by cleaning.—*J. J. McGrath, NYC.*



Collapsible lamp shades for families that frequently move long distances. Shades take lots of packing space and are easily damaged.—*Lt. Col. C. M. Busbee Jr., San Francisco.*

Everyone has his own pet idea of a gadget that he would like to see in general use. What's yours? We will pay \$5 for each one published. Please use Government postcards

only. Send to ILTS Editor, Popular Science, 355 Lexington Ave., NYC 17. Write your name and address clearly. Contributions cannot be acknowledged or returned.



The scientists stuffed me into Purdue's "whole-body" Geiger counter. For four long minutes I was—

Alone in the Dark with a Panic Button

By Martin Mann

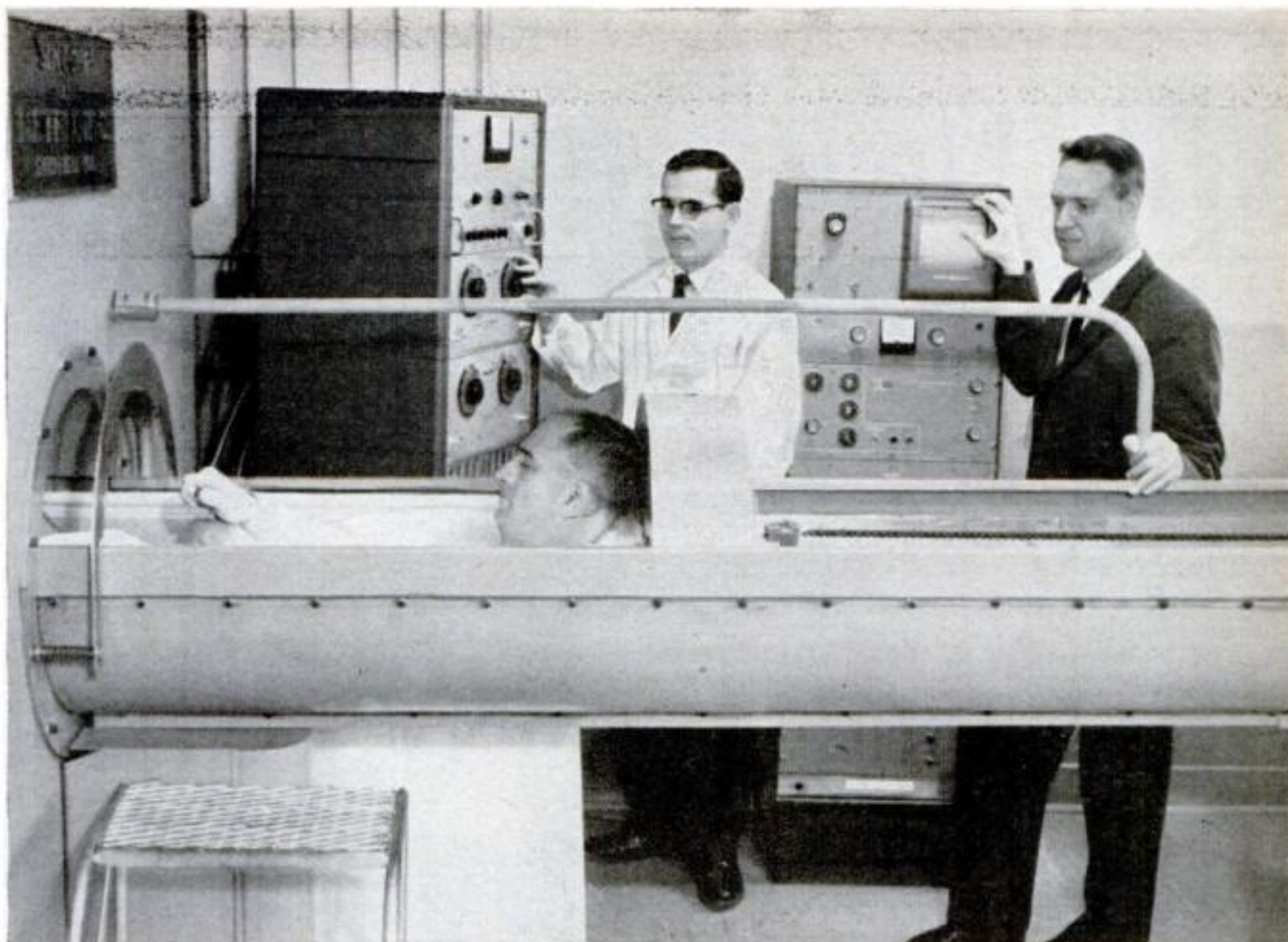
IN THE basement laboratory at Purdue University, LeRoy Shipley murmured to me soothingly.

"If the close quarters upset you, press the button and you'll pop right out."

The Purdue researchers were about to stuff me into a six-foot-long, 20-inch-wide stainless-steel can—and close the lid. The can was surrounded by two tanks containing 180 gallons of a chemical that flashed with light when hit by atomic rays. The whole works was locked inside what looked like a butcher's freezer but had steel walls six inches thick.

They wanted to measure my body fat in a very unusual and precise way, by counting disintegrating atoms of my natural radioactivity (everybody has some).

I had washed myself from top to toe in a little shower room, then put on a surgeon's white scrub suit and paper slippers—ordinary dust is radioactive enough to louse up the measurements. Before I could step onto the machine,



Clutching the escape button in his right hand, the writer rides the motorized slide into the

"whole-body" counter. A safe company built the 40-ton steel box that shields machine.

Shipley stopped me, pulled off the slippers (which had picked up dust from the lab floor), and put on a fresh pair.

Now, arms folded across my chest, I lay stretched out in a steel tray like a corpse in a morgue drawer. A motor hummed and the tray slid me into that small black hole.

Black as the pit. Then it was dark, absolutely black. There was the faint smell of green soap from the shampoo I had used. I could hear the faint hiss of a blower (cooling counter circuits, not me), and distantly, as though under water, the reassuring conversation of the scientists outside. But was it ever dark!

Being a rush-hour-toughened veteran of the New York City subway, I am not given to claustrophobia. But, lacking any visual reference and cradled by that curved tray, I lost my sense of balance. Was I getting seasick? My heart pounded, my forehead sweated.

I was telling myself for the tenth time that I would *not* hit that chicken switch

when Shipley's cool voice announced, "One minute's count is completed."

How much blubber? After the fourth one-minute count ended, the motor hummed and I slid back into the world of the living. The data, after a run through the university computer, ended up about average, meaning I'm about 25 percent fat.

Purdue's scary machine measures atomic rays just like a Geiger counter. But it is more sensitive. It is one of only four "whole-body" counters in the world. Purdue uses it to count fallout contamination in packages of grain, milk, and wool. It also checks the people working around the university's atomic reactor to make sure they haven't picked up dangerous dust. But the main project now is the measurement of fat.

Overweight Americans reduce with all kinds of drugs and diets. Yet nobody knows how much of the weight loss comes from fat and how much from

[\[Continued on page 198\]](#)

Wild New Airplanes

Straight-up aircraft take off three ways

Three VTOL (vertical takeoff and landing) planes, each using a different principle for lift, are undergoing tests by the National Aeronautics and Space Administration (NASA).

Ryan VZ-3RY Vertiplane uses a deflected slipstream from two propellers up ahead of large double retractable wing flaps.

Bell X-14A gets lift from the exhausts of twin GE jets that can be rotated vertically for takeoff, horizontally for forward flight.

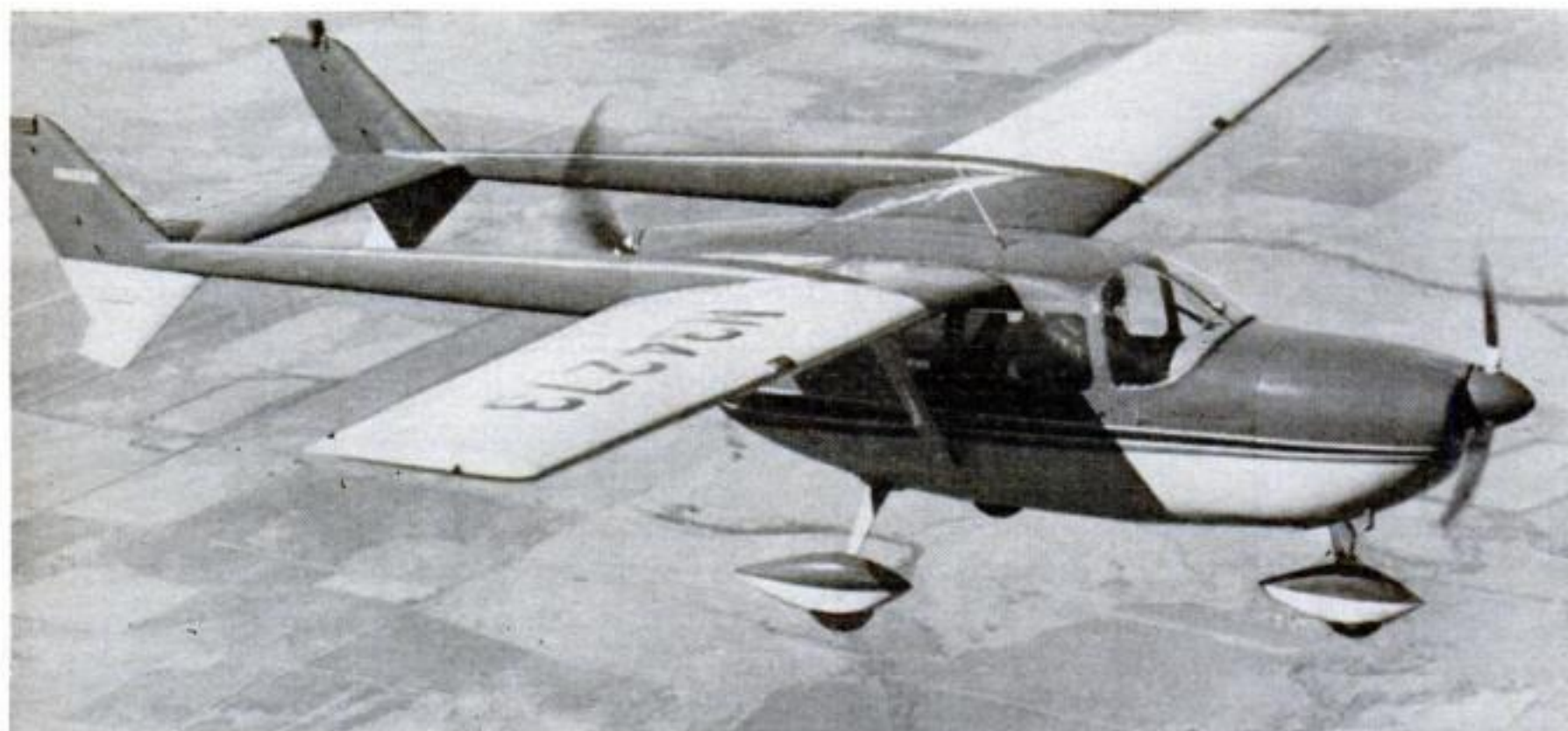
Ryan VZ-11 gets lift from GE fans spun by turbojet exhaust valved to them; they are louvered to help level flight.



Lycoming-powered Ryan VZ-3RY lowers flaps for takeoff.



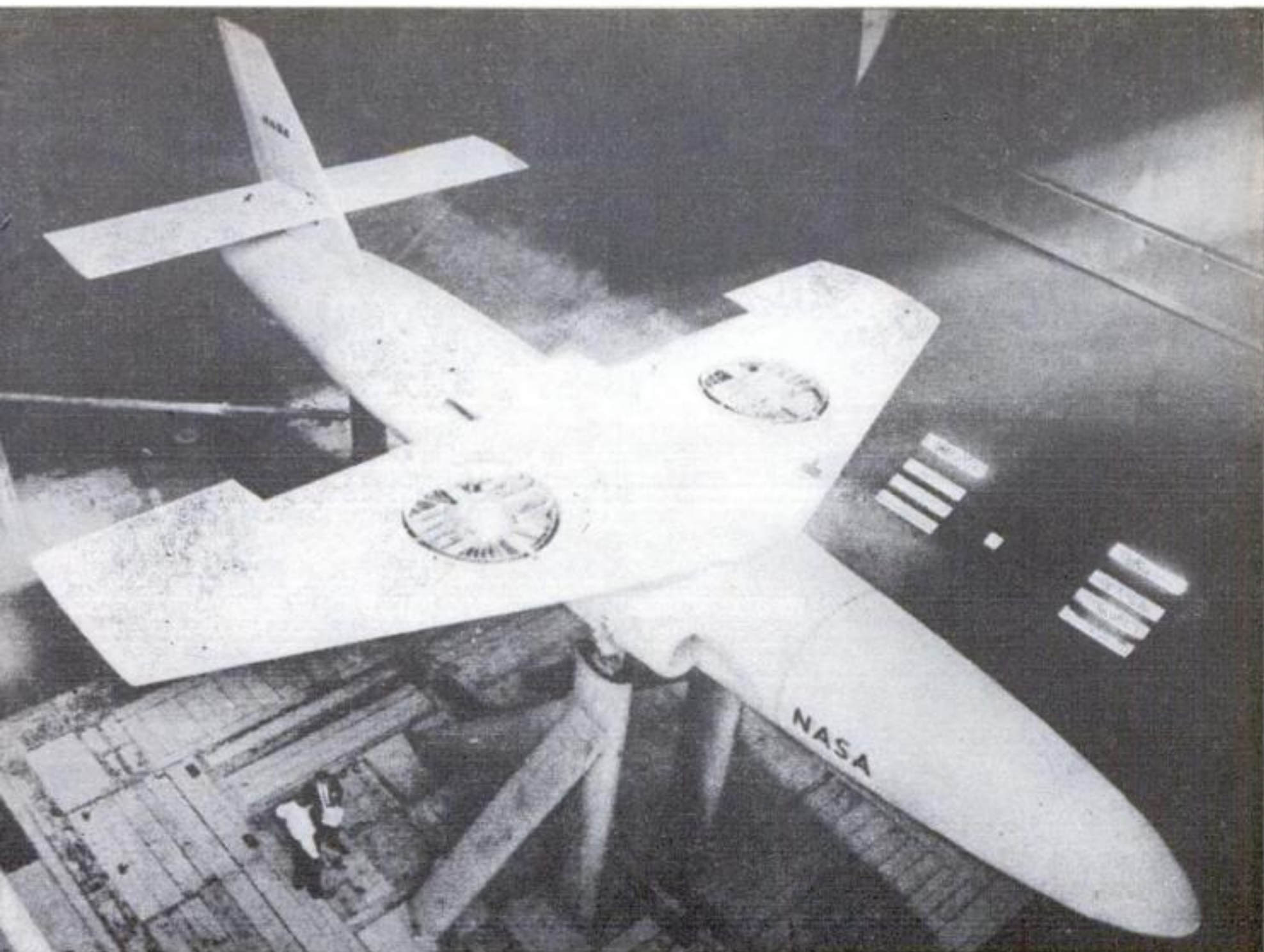
Wingtip jets give Bell X-14A control while hovering.



One engine for pull, one for push

Tandem engines, one in the nose and one behind the cabin, double power in Cessna's Skymaster without problems of lopsided

handling should one conk out. Twin tail booms leave room for the rear engine's push propeller. The plane was developed as a four-place business plane that is simple to fly and low in operating cost.

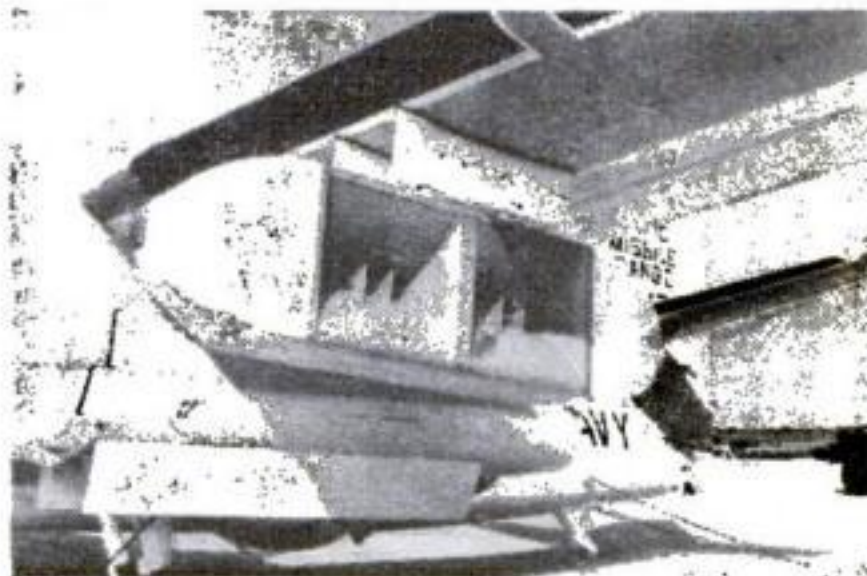


Wind-tunnel test for wing-fan Ryan VZ-11. First flight of plane is scheduled for mid-1963.



Small-plane windshield de-icer

Electrically heated windshields, common on airliners and big bombers, are now made for small planes. Tiny wires in the vinyl-coated windshield above at right keep it from frosting like the untreated glass at left during tests in a freezing chamber. Pittsburgh Plate Glass uses a GE control to keep temperature at 90 to 100 degrees. It's automatic or can be hand-switched.



Warning voice out of the blue

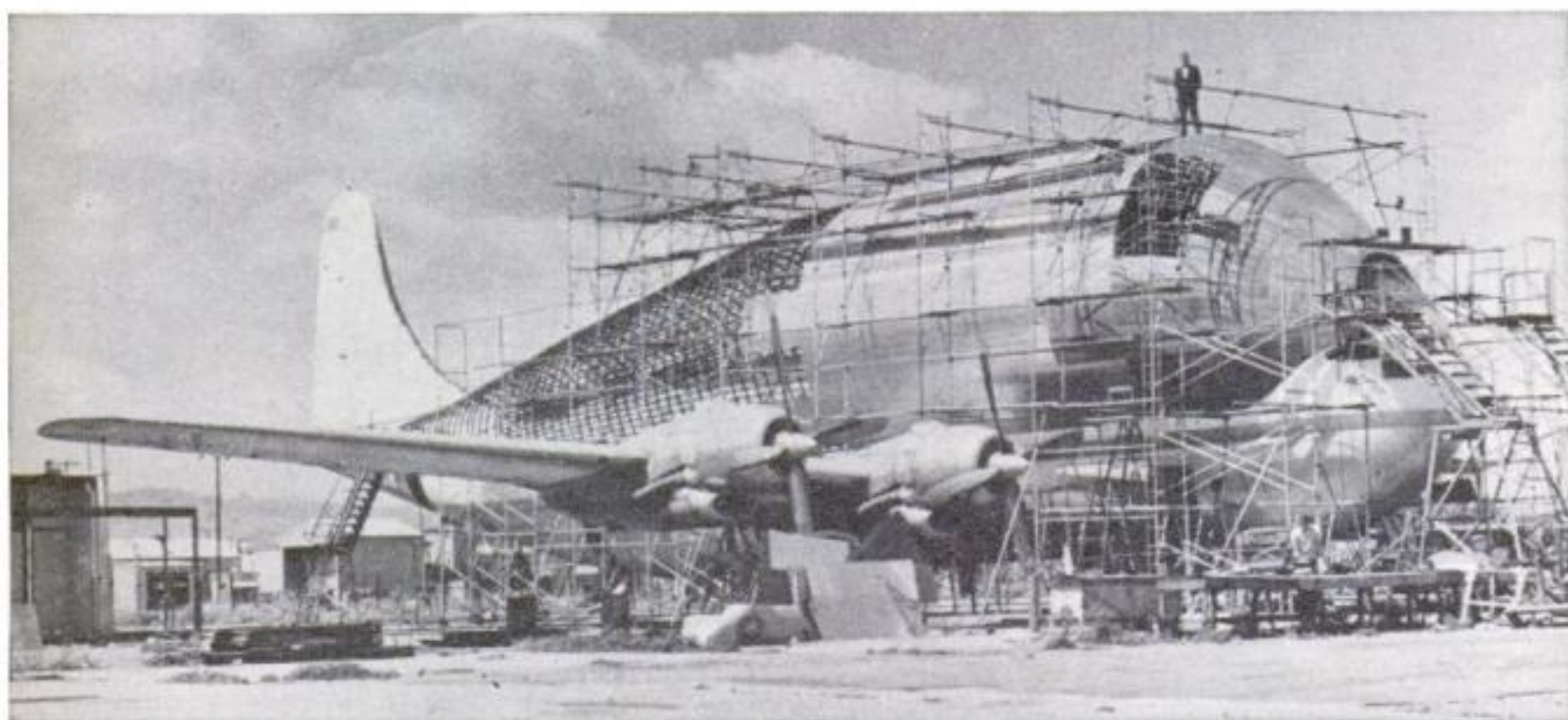
Loudspeakers mounted under the wings of this Grumman S2F-1 Tracker warn unauthorized boats away from target areas on the Pacific Missile Range during preparation for launchings at Point Mugu, Calif. On the Navy antisubmarine plane, they replace rockets, depth charges, or torpedoes carried during normal search and attack operations along our coasts.



Collapsible spare-parts amphibian

The Volmer Sportsman seaplane can be built in 1,500 hours, according to designer Volmer Jensen of Burbank, Calif., who

sells the plans. Cost, including a second-hand 85-hp. engine, is under \$2,500. The 80-m.p.h. plane has Aeronca wings and tail and a plywood-and-fiber-glass hull. Two can take it apart in under 30 minutes.



Boeing bloated for big boosters

The fuselage of this Stratocruiser was stretched to carry Saturn booster rockets. In photo above, fuselage height is being

raised from nine to twenty feet. A 200-inch section was also added aft of the wing. The entire tail section unbolts and swings open for loading. Aero Spacelines, Inc., of Van Nuys, Calif., did the job.

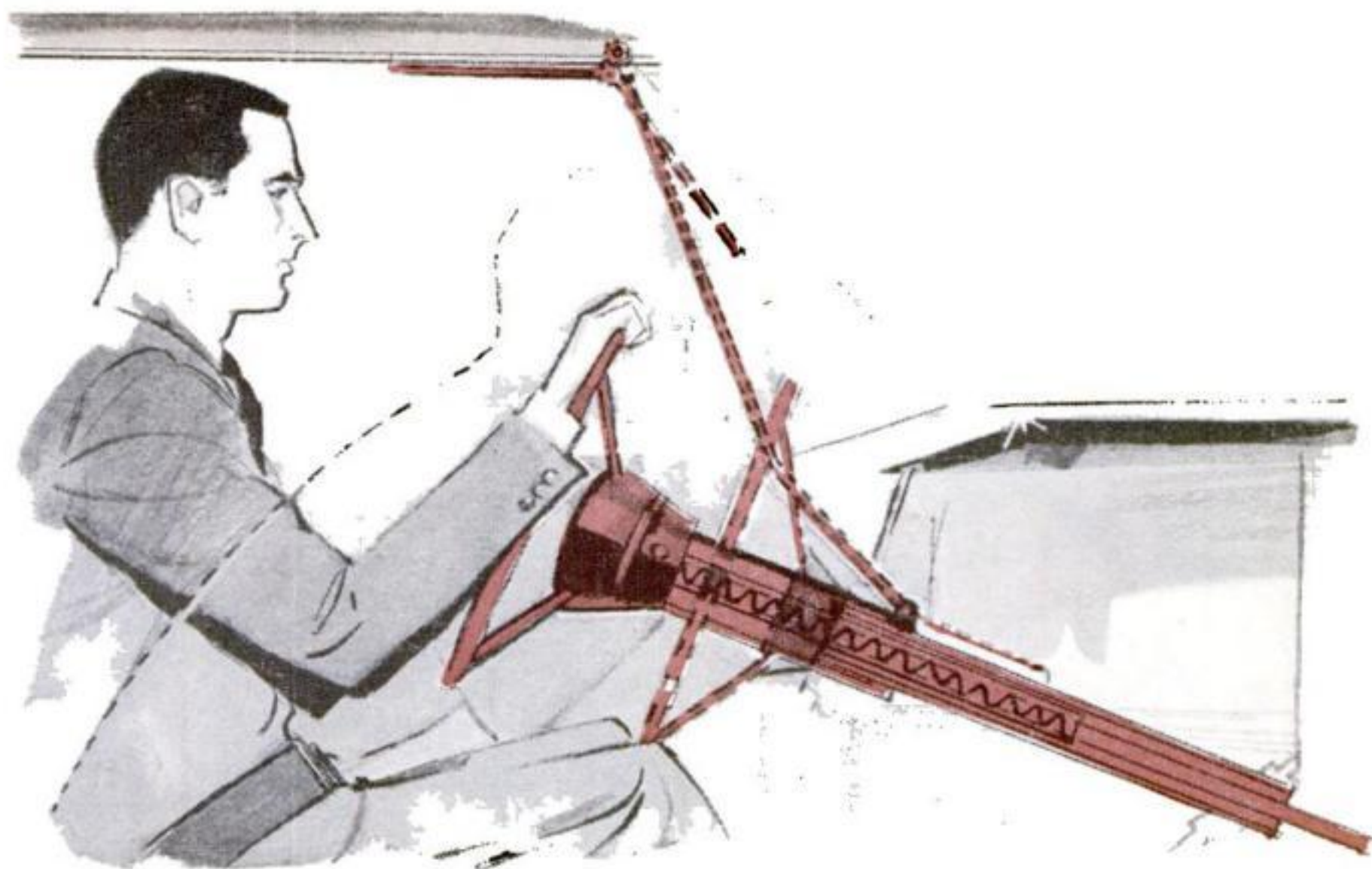


Jet copter floats, flies—and drives

Compressed air powers this Monte-Copter Triphibian helicopter. A gas-turbine compressor pushes air up through the rotor head and jets it out the rotor tips. For-



ward propulsion is provided by residual thrust. Entire thrust may be used for taxiing on roadways or water without the rotors turning. Wings with tip tanks serve as outrigger floats. The fiber-glass-hulled craft does 95 m.p.h., cost \$30,000.



Crash wheel lowers crash pad. Instead of spearing a driver in a crash, a newly patented steering post would telescope, compressing a spring normally holding it at

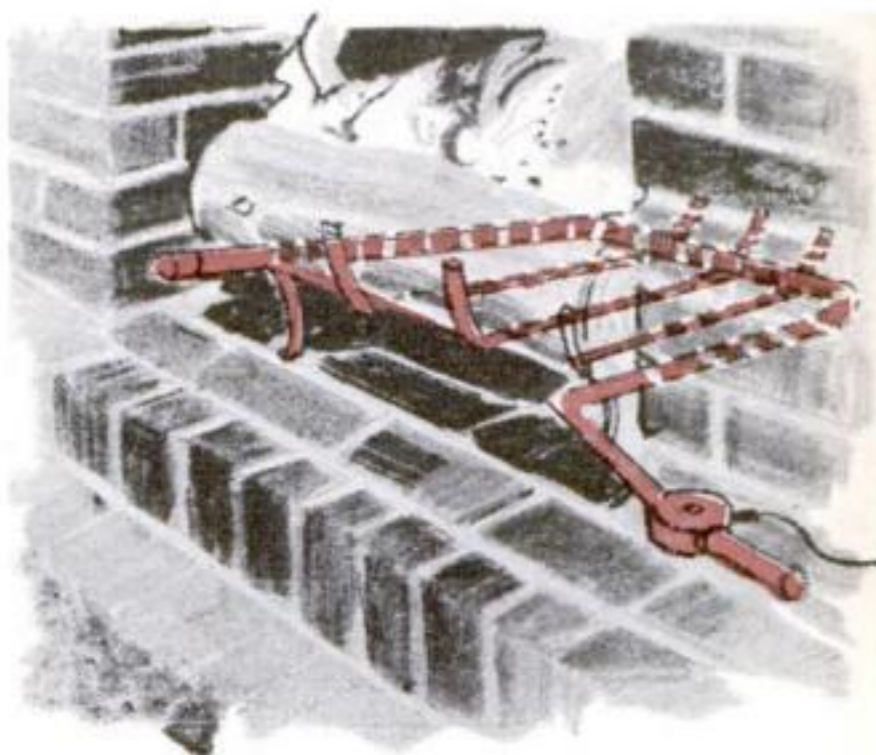
driving height. Its movement—relayed by wires running through the door frame—would lower a cushioning, splinter-stopping visor between driver and windshield.

New ideas from the inventors

Safety-pin spring keeps it safe. A safety pin might be safer if its spring action held the point safely inside the pin instead of pushing it outward. To fasten this pin, you'd pull the point wide open, push it through the material, then guide it into a U-shaped catch that is open at the top.



Blower spreads fire heat. A fireplace fire should warm a larger space faster and more efficiently if built on top of a tubular metal grate like this. A blower at one end would pull cool room air into the fire-supporting frame, push it out the other end after it had been heated.



More inventors' ideas



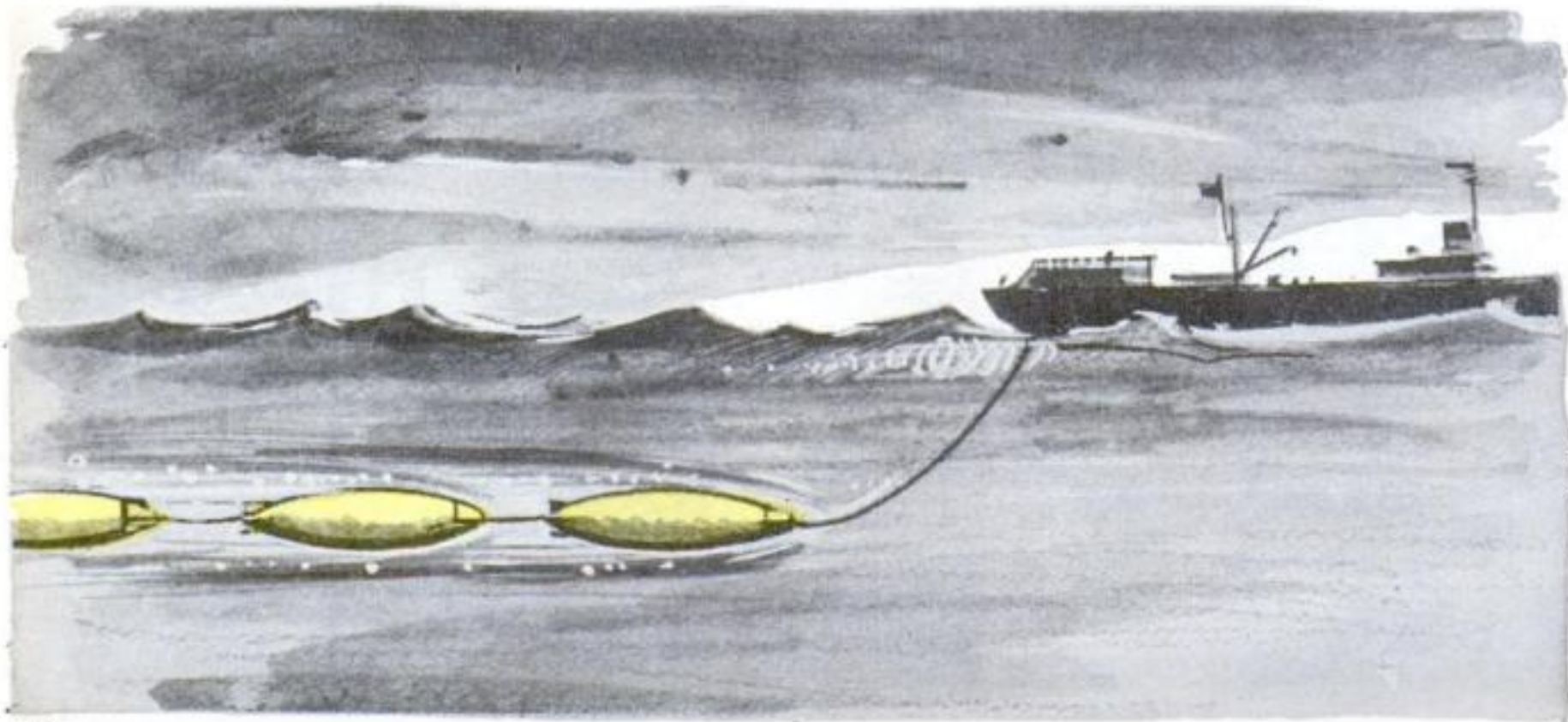
Guide improves bowler's aim. A bowler, according to this inventor, could pick his spots better after practicing delivery with this adjustable sighting guide. He'd line up one headband-mounted pointer with a particular pin, sight through the other at the alley. By putting the ball exactly on the spot indicated in the alley sight, he'd be on a target course. Practice would make adjustment for proper delivery automatic.

Shells haul cargo under water. Powdered or liquid freight might be transported faster and more economically if it were towed underwater in these shells. Since they would travel submerged and protected from storms and rough seas, the hulls could be



Indoor clogs protect floors. A farmer, mechanic, deliveryman—or even an ordinary householder—wouldn't have to worry about tracking dirt, mud, or grease indoors if he put these overshoes on before going in. The flanged, strap-on soles would cover the shoe bottoms and catch drips. Convenient for frequent in-and-out trips, they'd snap on or off quickly to save foot-scraping and shoe-changing time.

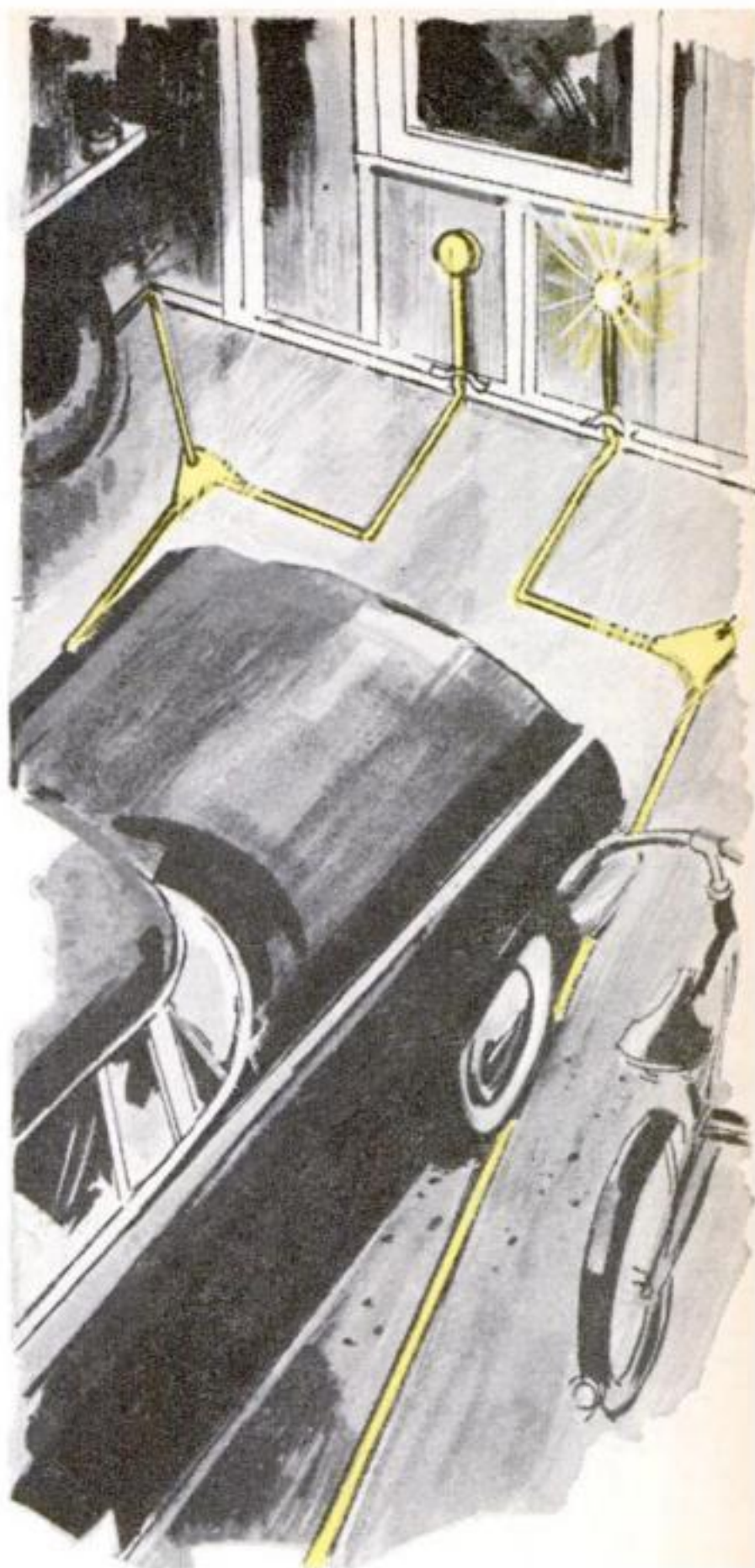
made of thin plastic, which would also adjust to the cargo and resist sloshing. They'd reduce ship power requirements by cutting down dead weight, and might be discarded after each use or stacked on deck, in sections, for the return trip.





Flashlight signals a biting fish. With this rig a night fisherman could throw out his line and relax without missing a catch. He'd clip his flashlight—minus its bottom cap—against a pair of spring contacts on the wooden base, and tie his line to a lever arm. Any tug on the line would make the signal light blink on.

Basket rolls to court. This mobile, adjustable basketball goal could turn any paved area into a practice court or playing arena. It could be raised or lowered to suit the age and skill of any player. A weighted base would hold it steady, but it would roll easily when it was tipped back on small wheels at the rear.



Signal tubes help you park. Fastened to a garage floor a comfortable car-width apart, these fluid-filled tubes would help you navigate a clutter of toys and tools. Connected to the tube ends through pressure switches, lights would signal if a wheel strayed over the line, too near a parked mower.

The following patents have been issued on these inventions: Crash post—No. 3,011,823 to W. O. Maher, North Adams, Mass.; Pin—No. 3,030,682 to R. C. Wilson, Harper Woods, Mich.; Grate—No. 3,001,521 to A. L. Reilly, Auburn, Wash.; Bowling sight—No. 3,029,517 to L. O. Frey, Mendham, N.J.; Shoe clog—No. 3,009,269 to J. S. Folk, Bellevue, O.; Cargo hulls—No. 3,018,748 to L. Denis, P. Wolff, and J. Brocard, Paris, France; Fishing signal—No. 3,024,561 to W. Wyatt, Plainville, Mass.; Goal—No. 3,025,058 to R. Brumfield, R.F.D. 2, Tell City, Ind.; Car guide—No. 3,026,508 to G. H. Muller, Northville, Mich.

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D.C. at 25 cents each. To write to an inventor, if the address given above is insufficient, address him (by name and patent number) in care of the Commissioner of Patents.



How to Chop Like a Champ

Putting a razor-keen axe blade precisely where you want it is a crucial art. The world's champ gives you some pointers

By George Daniels

HOW fast can a wood chopper chop? If he happens to be Dave Geer, he can sever a two-by-six in one stroke, fell a fair-size tree with two strokes, and slice through a 12-inch log in 16 seconds. Five-time winner of wood-chopping's top award, the North American World Championship, and holder of more than 50 other chopping trophies, he ranks as one of the all-time greats with an axe.

You wouldn't guess it from his appearance. A man of average build, he looks to be in his early 20s, and might tip the scales at about 160. Actually, he's 36, father of four, head of Norwich, Connecticut's, \$250,000 Geer Construction Co., and weighs in at 190.

I watched him slash through a 16-inch hard-oak log in 45 seconds, twice as fast as I'd ever seen it done before. I asked him how he does it.

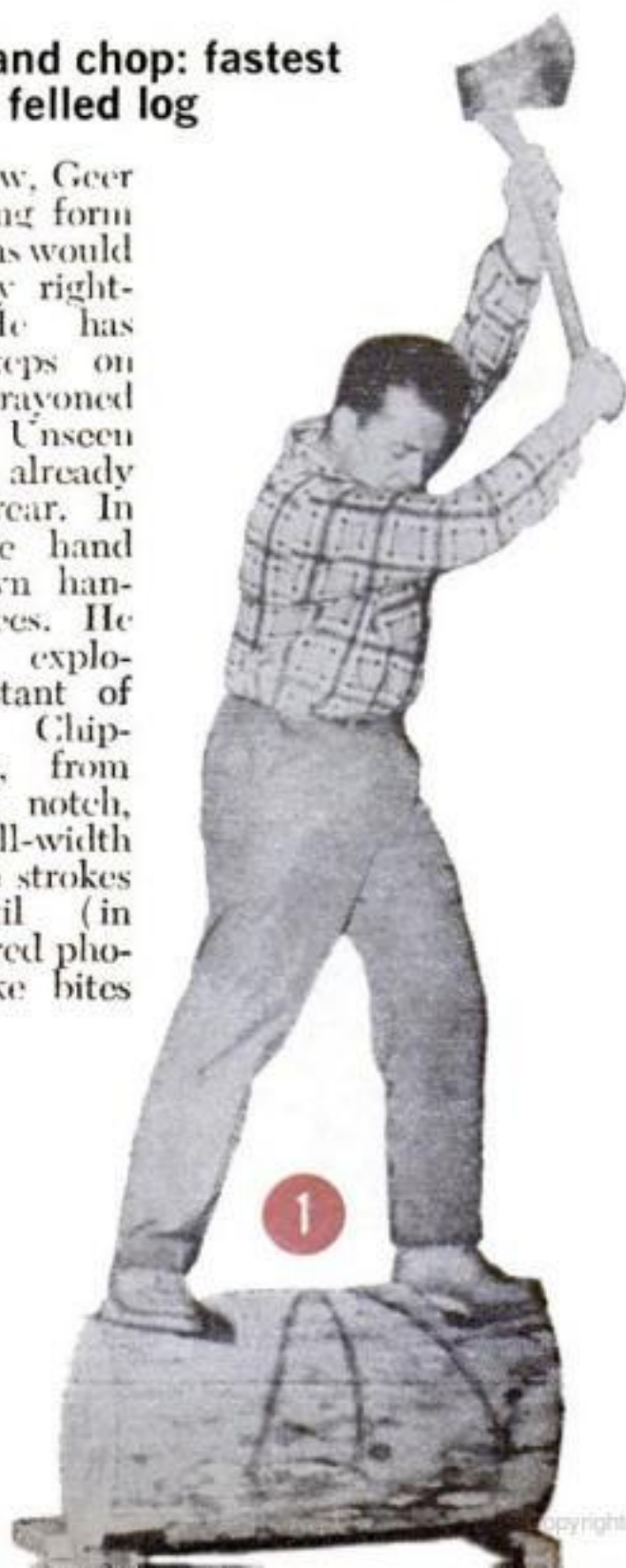
The trick, he explained, is in realizing that *accuracy* comes first, power second. If you can land your blade precisely where you want it and at the angle you want it, stroke after stroke, you can easily outchop a far stronger man whose aim wanders. The explanation is logical: Drive your blade exactly into the cut of the previous stroke or perfectly in line to extend it, and you get maximum cut depth and length out of each stroke. Miss the cut or hit out of line, and you literally start over again.

You can spot the work of an expert chopper by the surface of the severed log end—bandsaw-smooth if he's in the top ranks. Bad aim leaves a telltale hand-hewn look. Once you've mastered precision, put everything you've got into the power of your wallop, but never sacrifice accuracy. Geer says good marks-

CONTINUED

The underhand chop: fastest way to cut a felled log

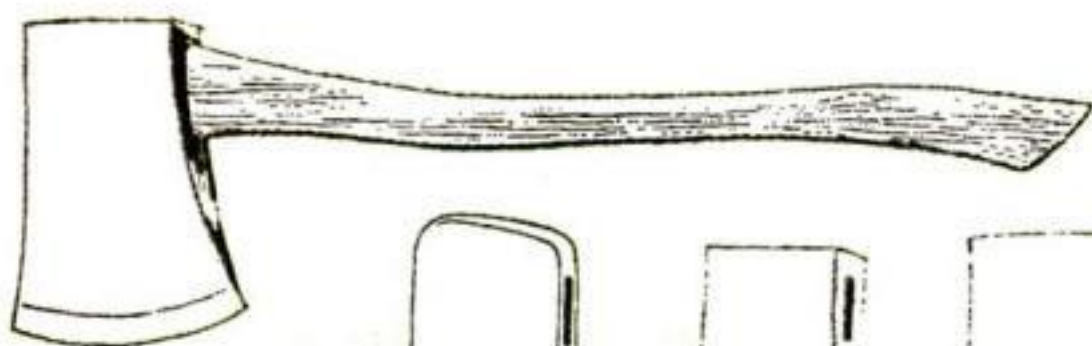
Adept southpaw, Geer shows his racing form (hand positions would be reversed by right-handers). He has hacked footsteps on braced log, crayoned target-line X. Unseen notch has already been cut at rear. In photo 2, note hand whipping down handle, bent knees. He breathes out explosively at instant of impact (3). Chip-freeing stroke, from other face of notch, shears off full-width chip. Alternate strokes continue until (in last, unnumbered photo) final stroke bites through.





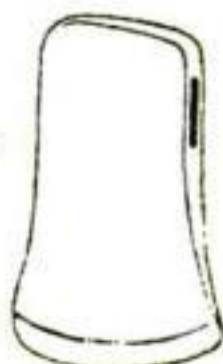
Geer's pet axes: At left, Connecticut-pattern head on a modified Maine-pattern handle; center, Australian axe; right, a short-handled axe Geer designed himself. Note the smoothness of cut ends of log, a tip-off to precision of his aim.





GEER'S ALL-AROUND FAVORITE: CONNECTICUT PATTERN WITH A 28-INCH HANDLE

Axe heads come in a variety of patterns



MICHIGAN



DAYTON



CONNECTICUT



KENTUCKY



JERSEY

Blades with long cutting edges are better for hardwoods. Most variations, Geer says, arise only from local tradition. Wood choppers

men generally make good wood choppers, and to prove it he has almost as many prizes for rifle shooting as for chopping.

Chopping style and axe patterns, he feels, are strictly an individual matter. You'll chop best with an axe you enjoy handling and with the kind of swing that comes easily to you. But Geer's general technique and choice of axes provide about as good a guide as you can use.

The underhand chop is the method

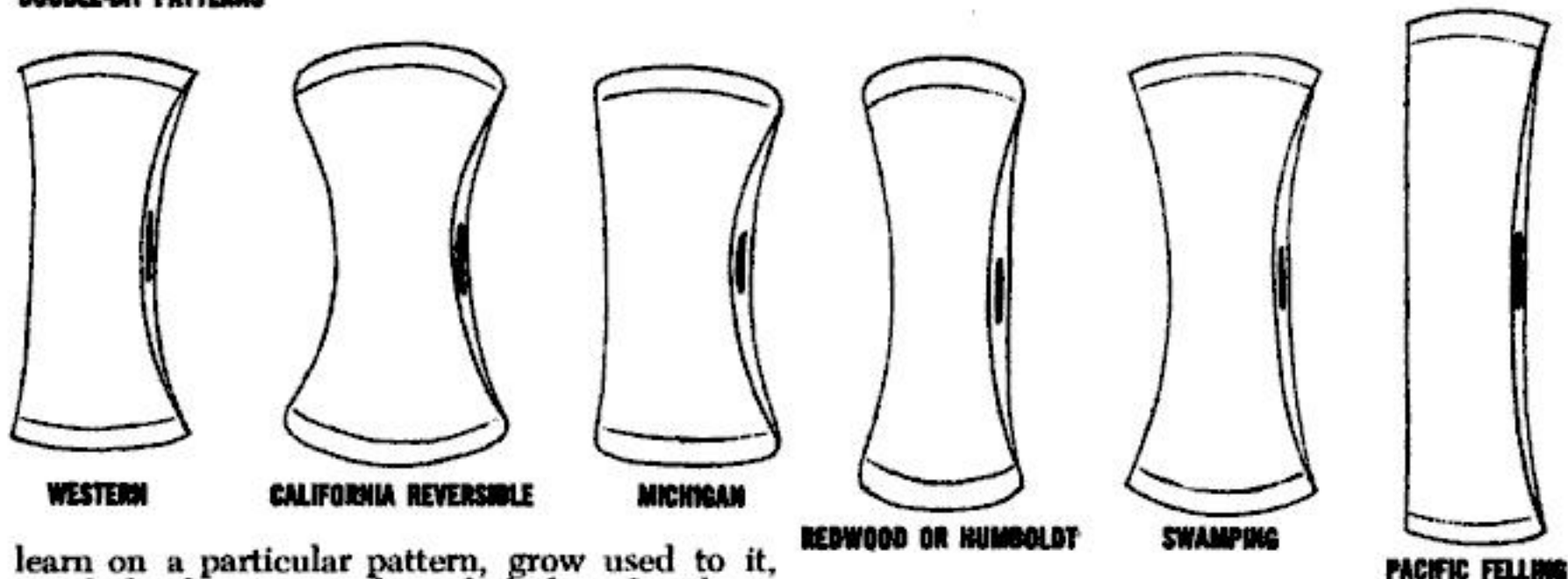
required in most competition. Geer, a former contract logger, says it's the best way to chop, whether on a championship log or a felled tree in your back yard. You stand on top of the log, feet well apart, and chop a V notch from one side, then from the other to sever the log when the notches meet. (In contests, the logs are made uniform either by being sawed square or by being lathe-turned to size—14-inch alder in U.S. Championships, 15-inch black eucalyptus in Australia.)



Standing-block chop, which uses a log spiked to a vertical support, simulates felling cut. Same sliding-hand motion is used as in under-

hand chop. This approach is obviously less dangerous to toes of wild-swinging beginners than is underhand. Geer has never cut himself.

DOUBLE-BIT PATTERNS



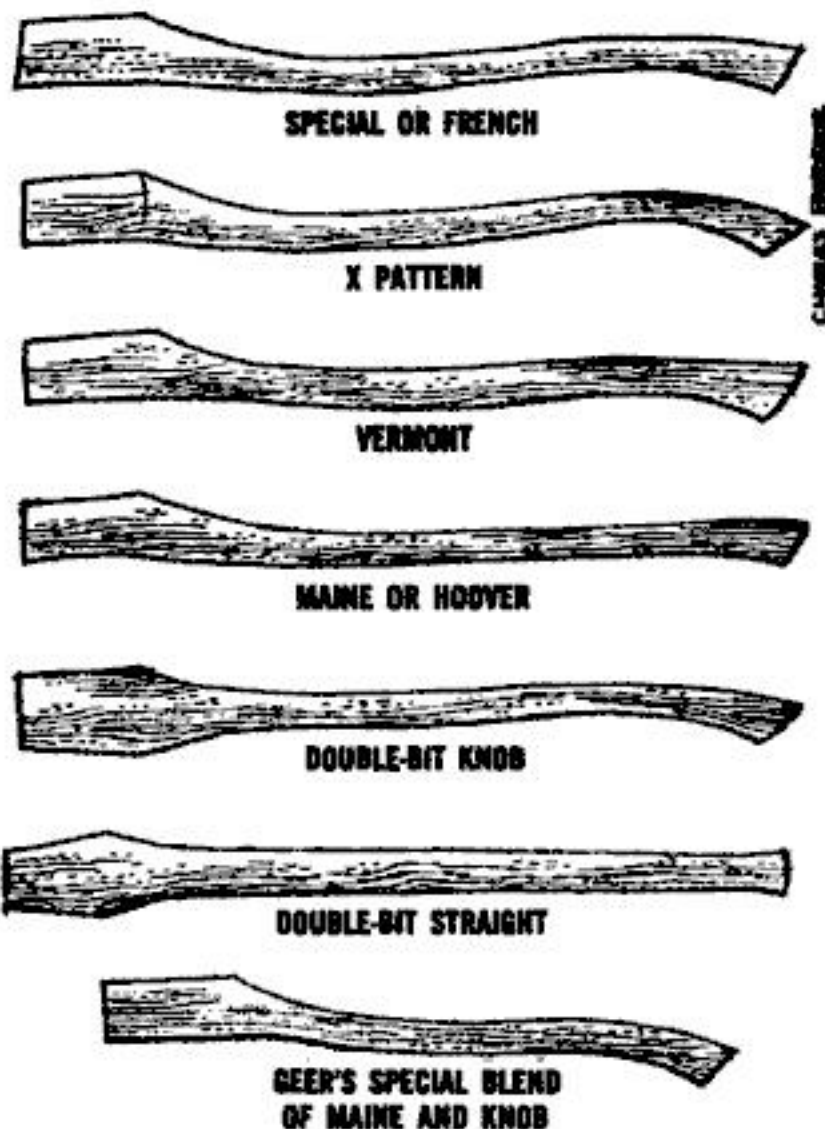
learn on a particular pattern, grow used to it, conclude that it somehow feels best for them.

On hardwood Geer uses a 5-pound long-handled axe with about a 5½-inch cutting edge. On softwood he uses a 6-to-8-pound short-handled axe with a 7-inch cutting edge. These "racing axes" are specially made by Emerson & Stevens Manufacturing Co., of Oakland, Me., by a process that welds an extra-hard cutting edge to a head of softer steel. The handles, tailored to order, come from the 90-year-old Tatem Manufacturing Co., of Eastford, Conn. For everyday back-yard chopping, his choice is a "Connecticut-pattern" axe with a 28-inch handle—a good bet for the average chopper.

The long-handled axe stroke starts with the axe overhead, left hand gripping the handle end, right hand about three inches under the axe head, if you are right-handed. The upper hand drives the stroke, sliding down the handle to accelerate axe-head velocity as the stroke progresses. When the blade

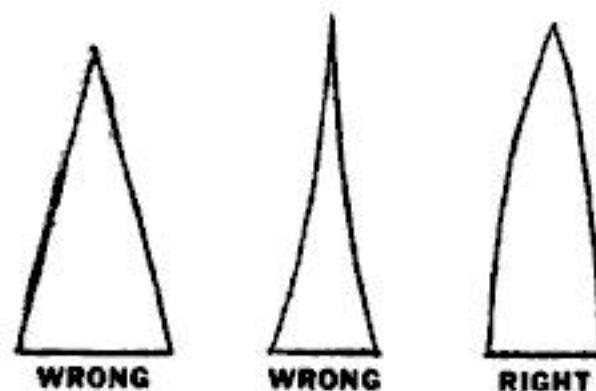
[\[Continued on page 194\]](#)

Patterns of axe handles



Sharpening an axe blade for durable keenness

Thin or hollow edges won't stand up for more than a few hard strokes. What does is a convex edge, often called a convex roll-off. Geer believes it important to finish-grind without deep scratches, then hone axe glass-smooth. Reason: Any scratches left may act as stress concentrations, which invite chipping or flaking.

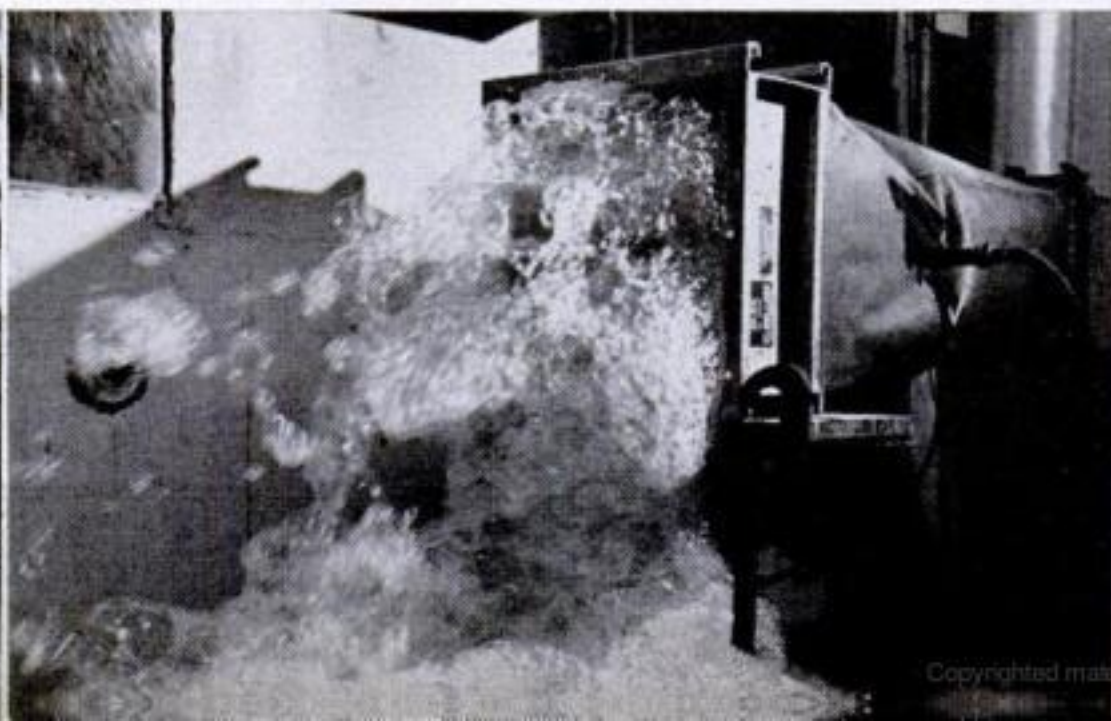
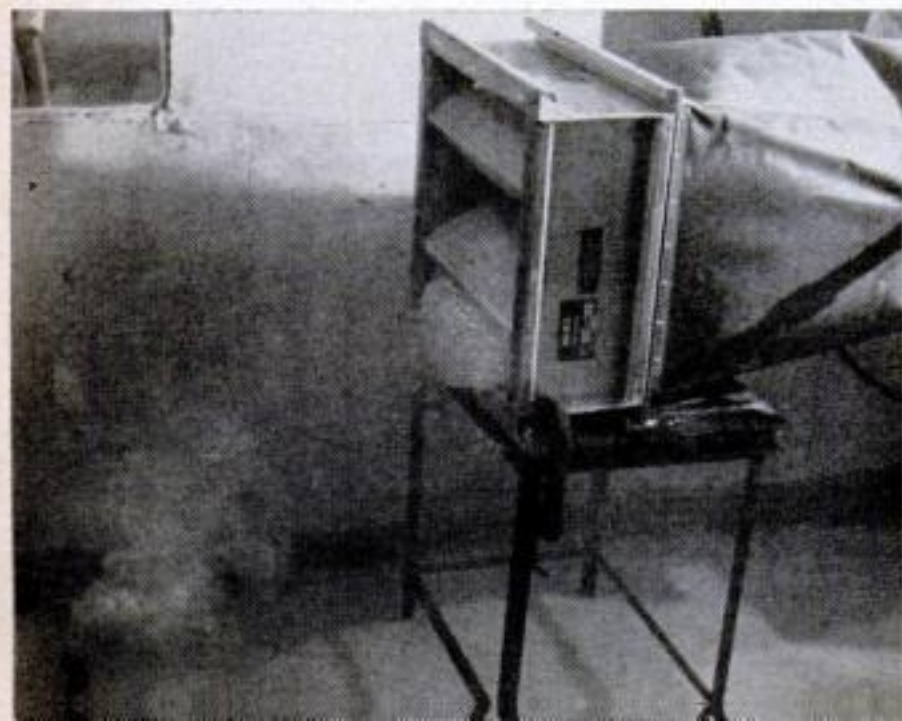




Wading through foam, technician checks air sampler, finds bubbles have removed "A-debris."

Smoke cloud from flare simulates atomic particles as blower of foam generator (on stand) starts sucking in air of test room at Harvard.

Bubbles begin streaming from foam generator's exhaust. Any nuclear debris clinging to their tough walls is effectively removed from air.



Atomic Troubles?

Just Blow Bubbles!

A nuclear-power-plant accident could loose a deadly radioactive cloud—but this suds-making device would stop it in its tracks

SUDS may come to the rescue to catch and trap the dangerous radioactive substances that an atomic accident could spew into the air.

At Harvard University, Prof. Leslie Silverman and co-workers are trying out the novel idea. To simulate nuclear debris from an atomic-reactor mishap, they fill a tiny closed room with smoke. Then a blower sucks the room's "contaminated" air through a foam generator, in which a spray head directs a fog of foaming agent against a cloth screen covering the exhaust opening.

Blowing the air through the screen yields a shower of bubbles. The debris-simulating smoke particles cling to the walls of the tough bubbles, the experimenters find. As the bubbles break, they deposit the trapped debris on the floor. That would end the travel of radioactive material, until a decontamination team arrived to remove it.

To encapsulate large amounts of air rapidly, the researchers have developed a liquid agent of much higher foaming

ratio than the foam used in fire-fighting. They make it up of a commercial detergent, plus chemicals that combine with radioactive atomic-fission products.

With enough foam generators, suitably spaced, all the air inside a reactor could be trapped in minutes. It could even be sealed permanently in bubbles, Professor Silverman suggests, by a hard-setting plastic foam. The method is cheap and requires little equipment.

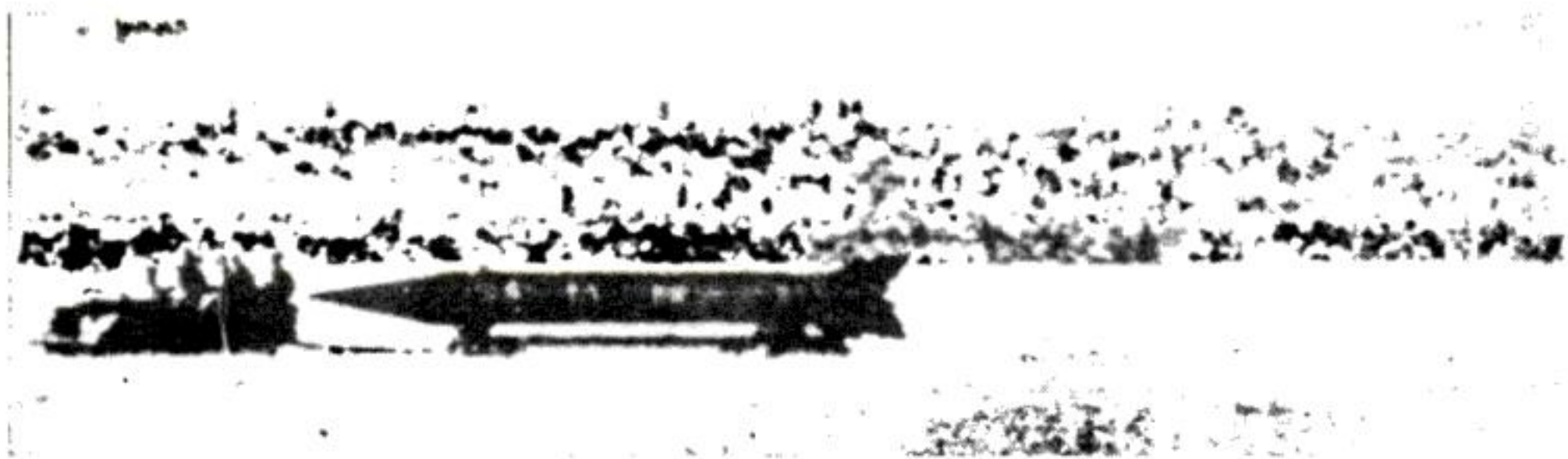
In normal operation, an A-power plant's fuel elements become impregnated with highly radioactive fission products. If the fuel elements melt down or vaporize in a "runaway," or other accident, these hazardous substances will be freed. In England a reactor fire released enough radioactive iodine to contaminate the local milk supply. Today, huge steel shells surround A-power reactors in populated areas to prevent escape of nuclear debris. Trapping it before it gets out of the reactor promises a quicker, simpler, safer way.—*John H. Lannan.*

103

Within a few moments, this mass of foam half-fills the test room. Bubbles have trapped the simulated radioactive particles, leaving the

air free of contamination. Installed in an A-reactor, such a system could avert the escape of dangerous radioactivity in an accident.





Soviet T-9 missile is transported to firing site by erector-trailer towed by a truck. It's fired

Battlefield Rockets for

IF THE Soviet Union gets into a shooting war, its equivalent of the American GI will have no less than eight different sizes of battlefield rockets to lob at the enemy. Some of the rockets can tote nuclear warheads.

This is the estimate of U.S. intelligence experts who have been looking at Soviet

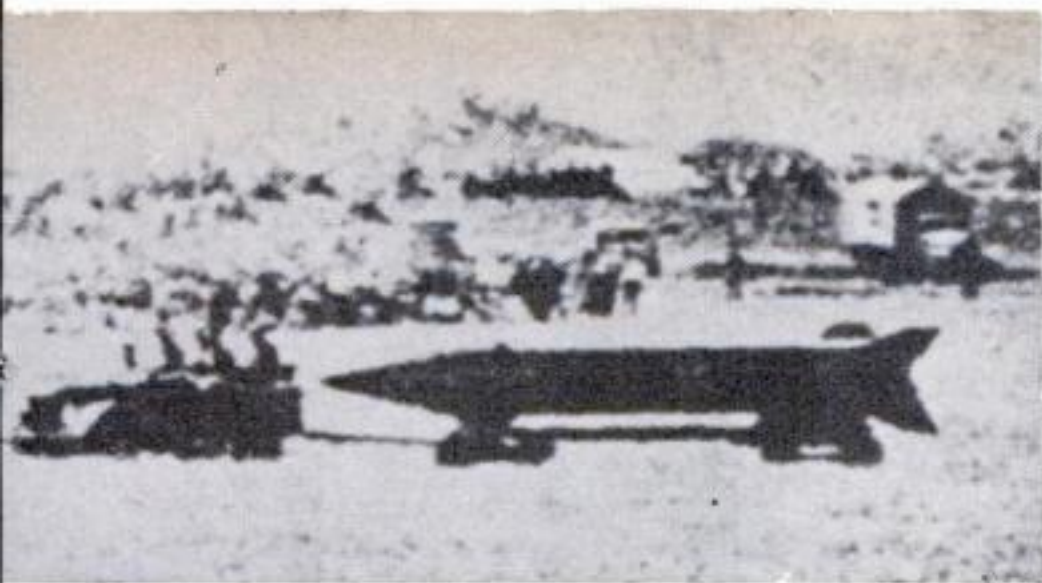
military might in May Day parades since the close of World War II.

By comparison, U.S. infantrymen and artillerymen have a minimum of seven tactical rockets. Their names are familiar—among them the Corporal, Redstone, Sergeant, and Pershing. The U.S., too, has battlefield nuclear warheads, tested



Mounted on a tank chassis, T-5B rocket weighs, with carrier, about 36½ tons. It can carry a

nuclear warhead. Biggest U.S. battlefield rockets have a range in excess of 200 miles.



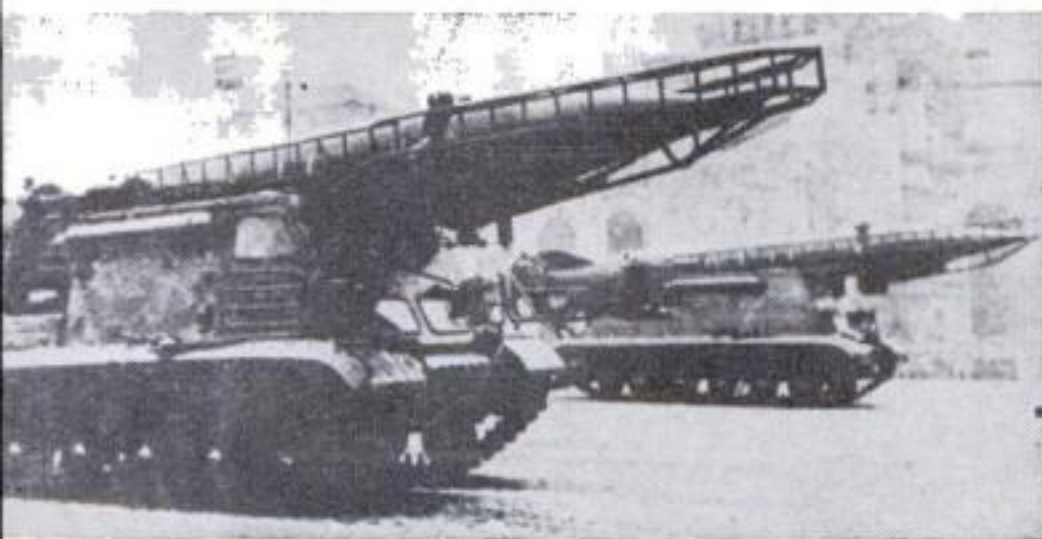
from vertical position, has 100-mile range.

the Red GI

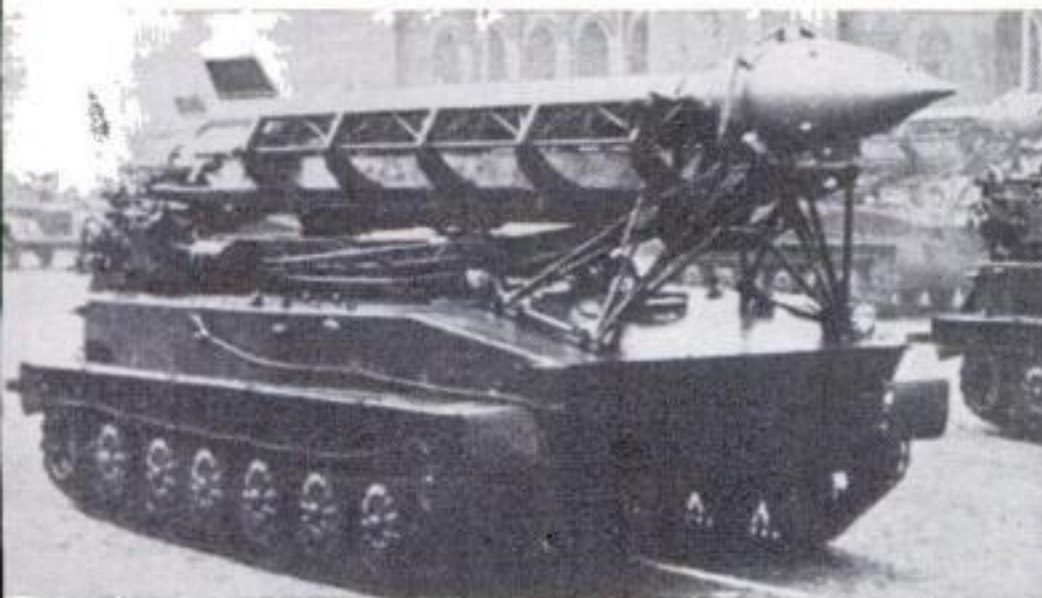
under mock-war conditions on our western deserts.

The Soviet's largest known battlefield missile is the T-9. It weighs 20,250 pounds and is 37 feet long and about four feet in diameter.

On these pages is pictured some of the Soviet rocket armament.



Big T-7A Soviet rocket, though transported by tank, is fired vertically from a special mount.



T-5C rocket can be mounted on amphibian tank. For firing, tank is stabilized by jack pads.

Launchers for rockets of smaller caliber



SMALLEST SOVIET LAUNCHER



WARHEAD WEIGHT: 128 LB.

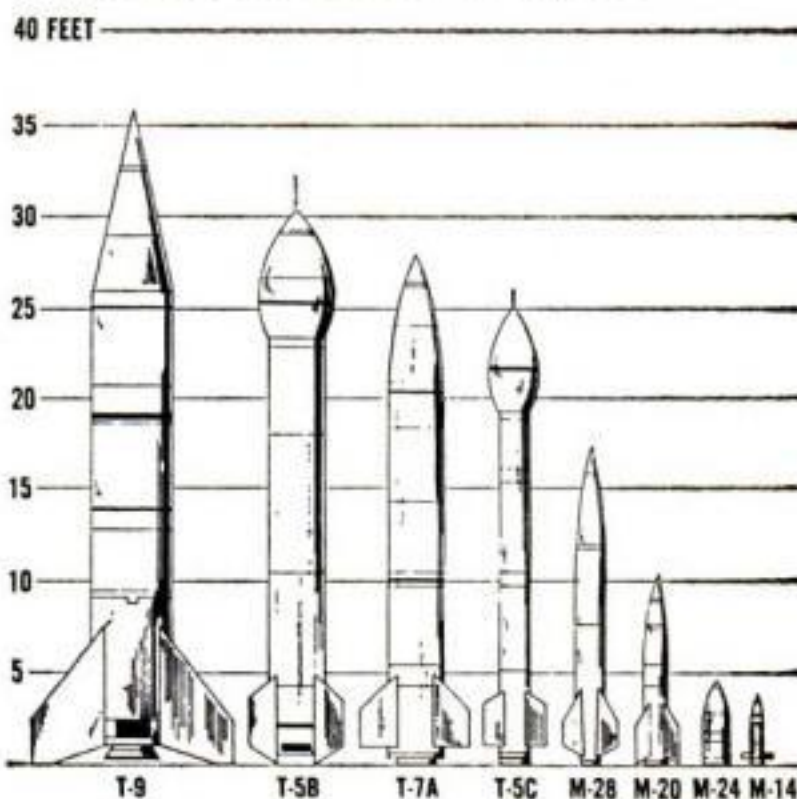


TRACTOR-MOUNTED
12-ROUND BATTERY



SMALL ROCKETS
FOR BARRAGE FIRE

How Soviet rockets compare



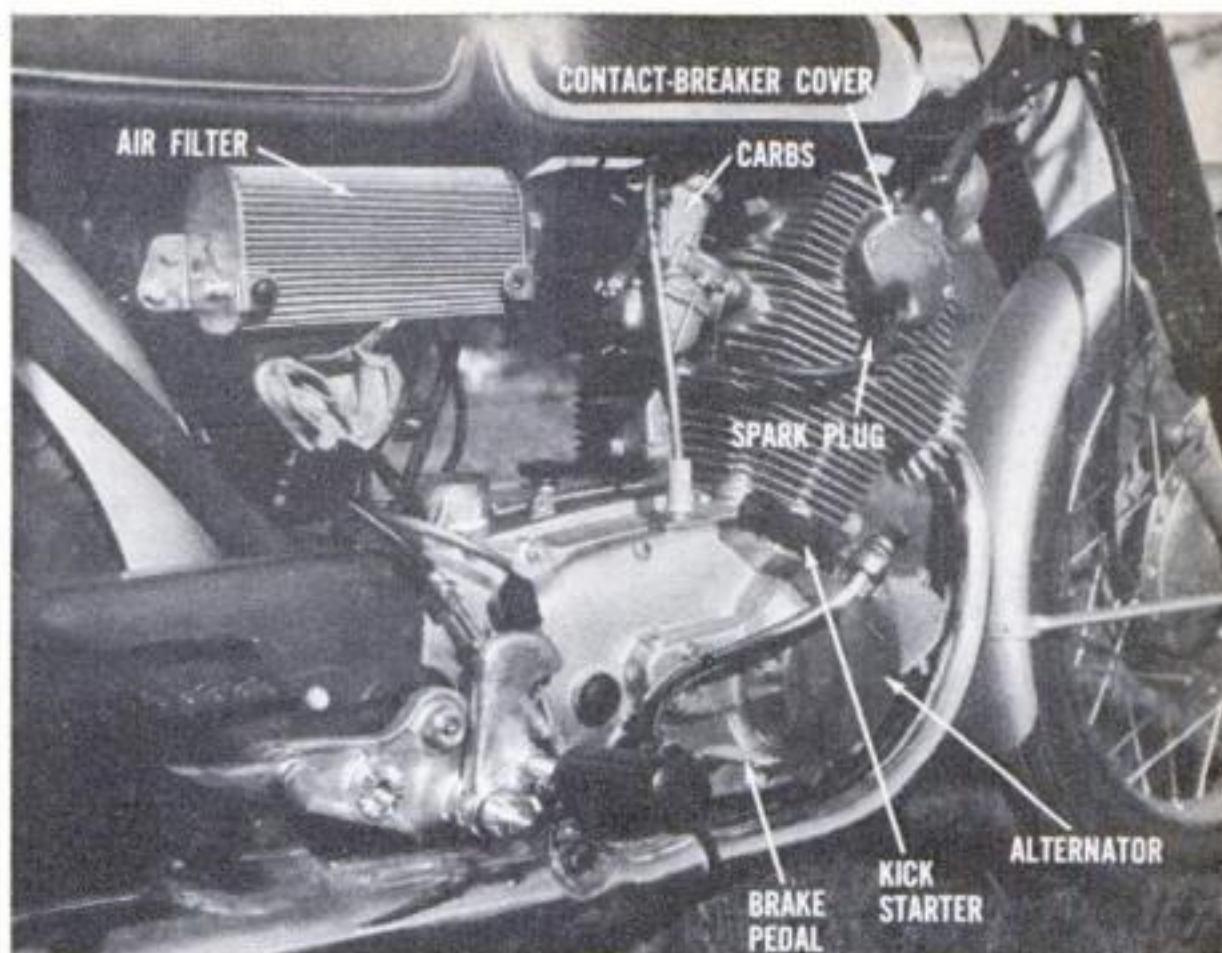


Hot Little Honda

By Erik Arctander

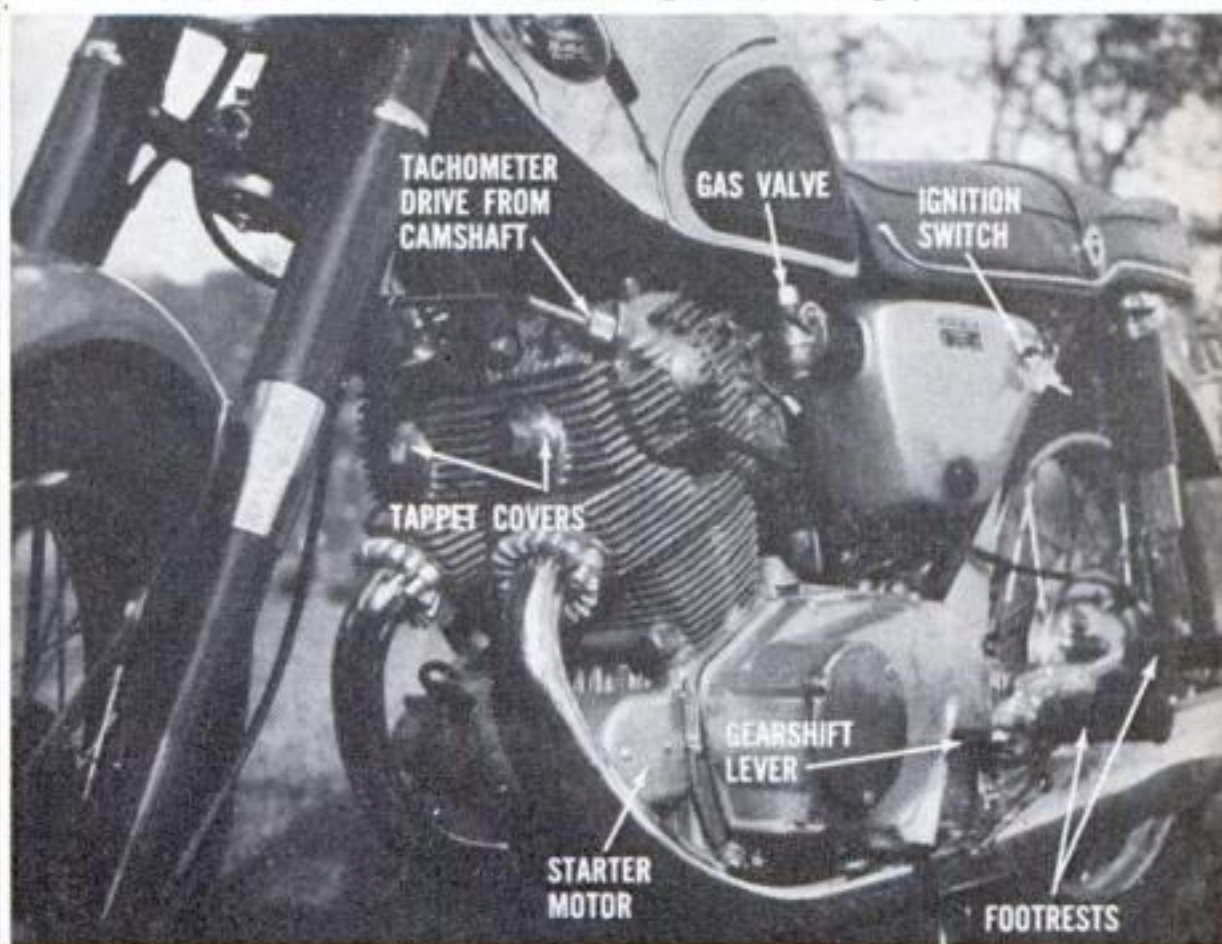
Newest sensation of the many ingenious details.

FIFTEEN years ago, ex-auto mechanic Soichiro Honda bet one million yen that he could build the world's best lightweight motorcycles. The odds were not favorable. Honda's million-yen investment amounted to a modest \$2,778; his formal training consisted of some night-school courses; and his only experi-



Pretty as a picture, this cute little mill just loves high revs.

Portside view reflects engine's quality design, excellent finish.



motorcycle world, this lightweight Japanese scorcher has
And its sophisticated little engine is red-lined at 9,000 r.p.m.

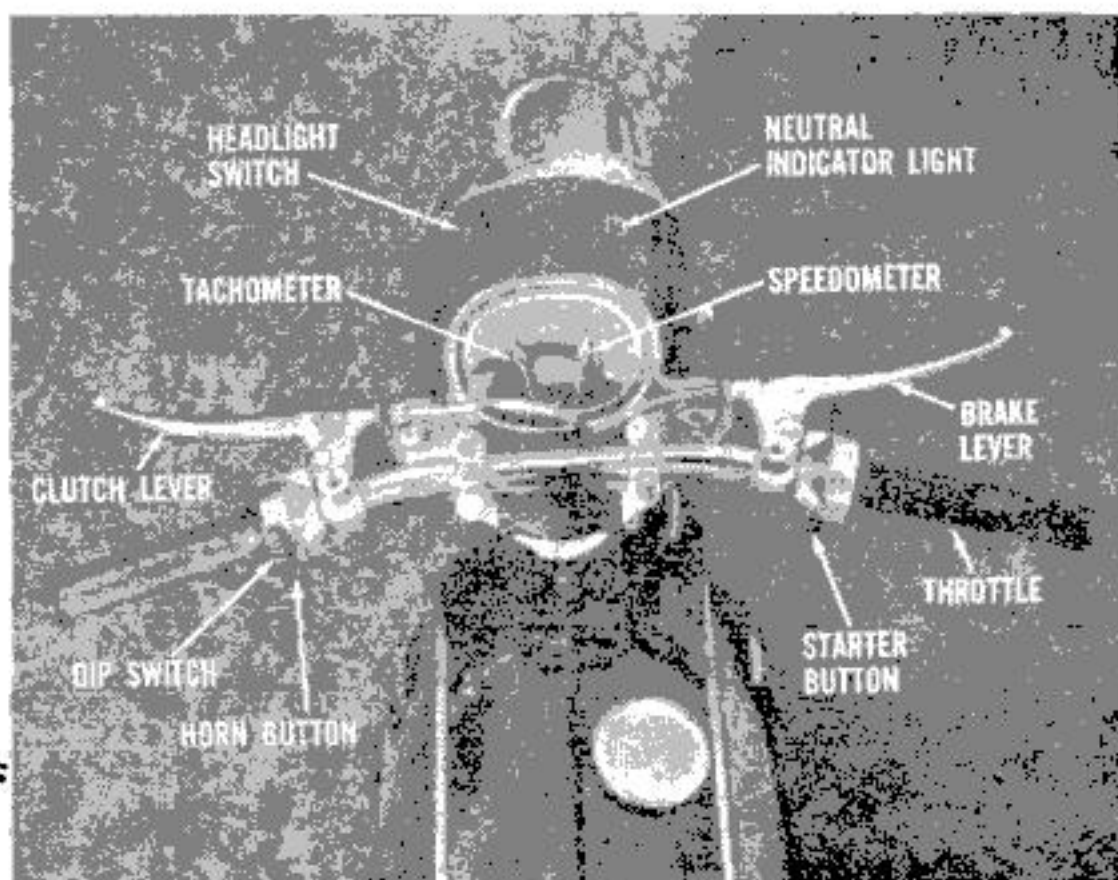
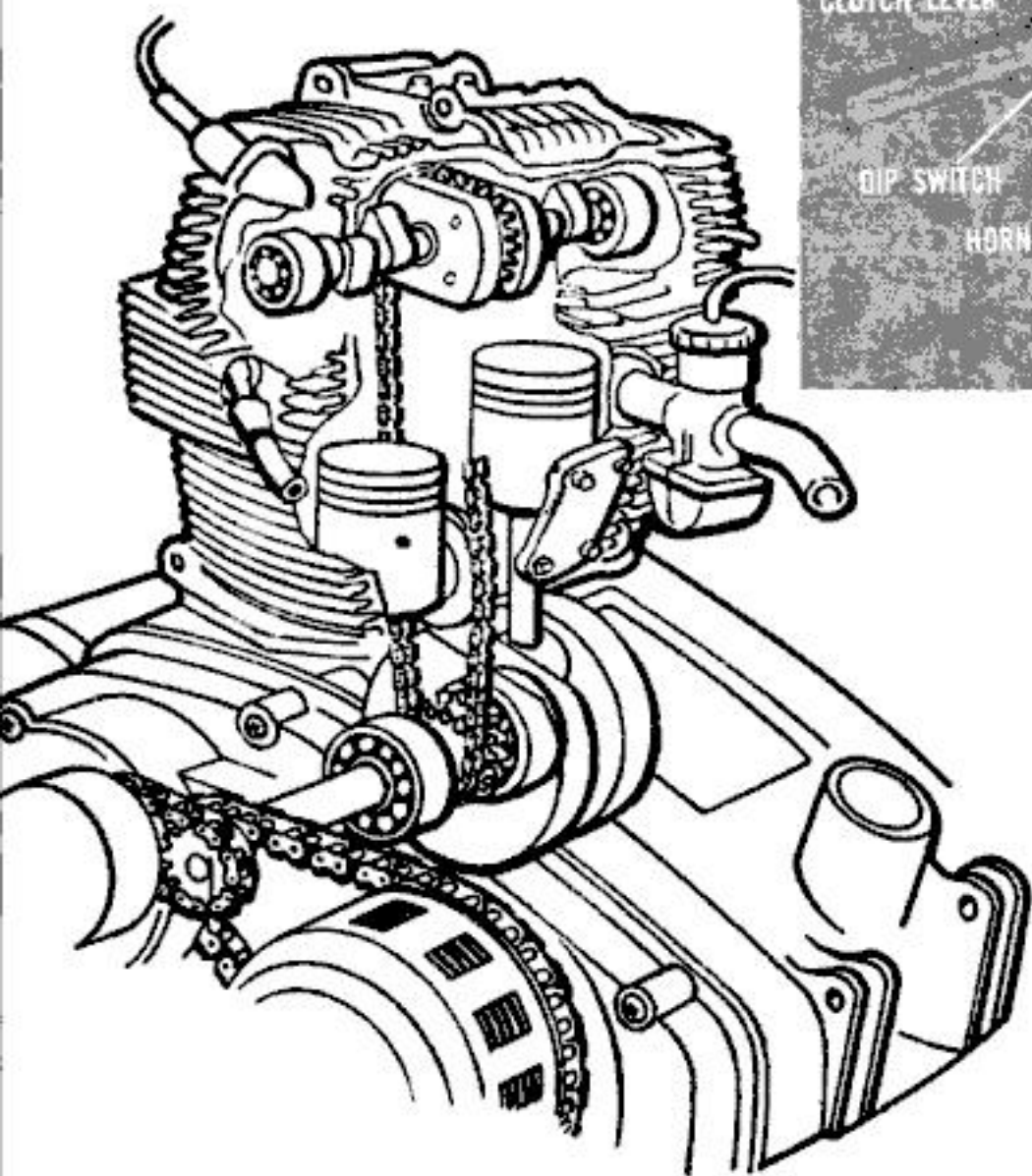
ence with two-wheelers had come from motorizing bicycles with war-surplus engines.

Today the Honda Motor Company's 6,000 employees turn out 1,500,000 motorcycles a year. This makes Soichiro Honda the world's largest manufacturer of two-wheeled vehicles. The 56-year-old

Japanese is now many times a millionaire—in dollars as well as yen.

The Honda formula: Produce a lightweight machine with heavyweight performance, add unexpected luxuries, make the price a bargain, and arouse worldwide interest by cleaning up at Grand Prix motorcycle races. Honda's engine,

Not for women and children, this machine demands deftness and precision from its driver, repays in extraordinary performance from an improbably small engine. The built-up crank spins in antifriction bearings, and is dynamically balanced.



of course, is the heart of his success. As a British manufacturer said after taking one apart: "It's made like a watch and it isn't a copy of anything."

The largest Honda engine has a piston displacement of 305 c.c. (18.6 cu. in.), half the size of most European heavyweight motorcycles and a third the size of the largest American machine. Yet it cranks out 28 hp. and 18 lb.-ft. of torque, tops 100 m.p.h., hits 60 m.p.h. in less than 8 seconds, and finishes a standing-start quarter-mile in under 17 seconds at over 80 m.p.h. All of this from an engine that gets better than 60 miles to the gallon. Honda's miniature power plant is virtually a textbook exercise in wringing maximum performance out of a small-displacement engine.

High r.p.m. The Honda's engine—a short-stroke, OHC twin—develops peak

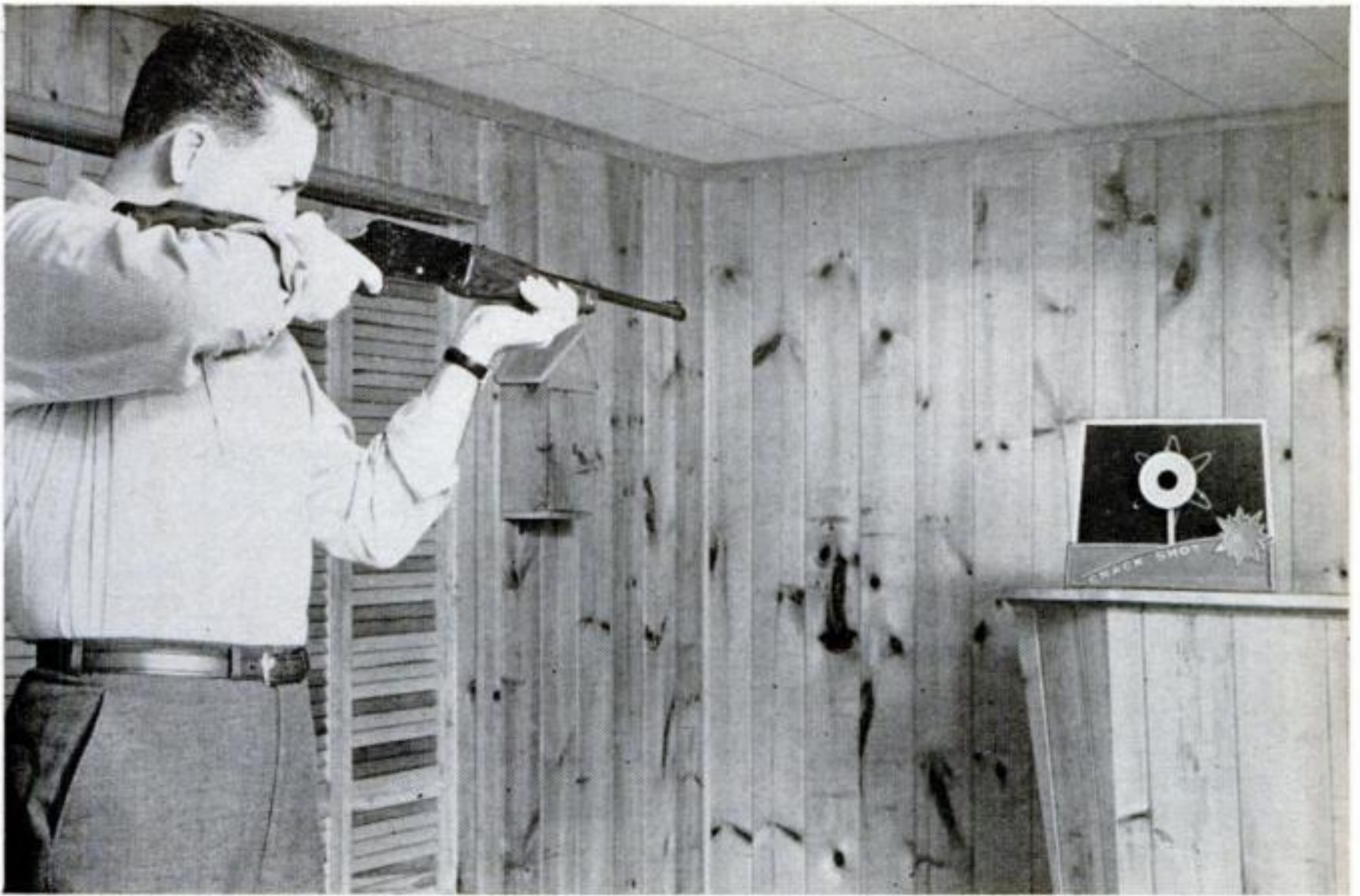
horsepower at 9,000 r.p.m. It's no secret that an overhead camshaft does the best job of opening and closing valves quickly. They are common on racing motorcycles, but most production machines use push-rod engines. Yet the single overhead camshaft here has added little to the engine's cost.

Instead of driving the camshaft through expensive gears, Honda hooked it to the crankshaft with a single chain and a pair of sprockets. Then, to keep chain stretch from altering the timing, he added a chain tensioner. Other cam-chain tensioners can't be reached without opening up the engine; this one's adjusted easily from outside.

Efficient combustion. The cylinder head has hemispherical combustion chambers and runs at a compression ratio of 10:1. Heat dissipation is exceptional because the light alloy head, deeply finned, leans forward into the air stream at an angle that exposes its top.

Free breathing. Hemispherical combustion chambers allow big valve openings and Honda has them. Valve timing is sporty, but not so extreme as to make the engine run roughly at low speeds. Twin exhausts leading into large, tuned mufflers extract the spent gases with

[Continued on page 206]



Rifle shoots infrared ray

You can stand in front of this target rifle without fear of being hurt. Instead of bullets, it shoots a beam of light. Both rifle and its special target are powered by

flashlight batteries. A bull's-eye is scored when a pulse of infrared light strikes the center of the target and activates a flashing light and a bell. The rifle is manufactured by Infrared Industries, Waltham, Mass., makers of electronic devices for the government's missile and satellite programs.



Garage folds against side of wall

A new awning garage bolts to an outside wall, folds flat when not in use, and pulls down to enclose a car. Its pivoted tubular ribs are spring-balanced for easy raising and lowering. British Carquad is made in seven lengths from 9 to 18 feet, can be attached to an existing garage for a second car or to house a small boat.



Russian building blocks

To help solve the housing shortage in the Soviet Union, Russians have devised a modular construction technique. A four-story apartment house is shown going up above in Krasnodar, prefabricated room by prefabricated room. Each concrete unit is fitted with doors, windows, and plumbing before being lifted into place.



Air-dropped Army tractor-crawler scrapes earth into ballast bowl . . .

Do-everything tractor can be dropped from sky

This experimental Army crawler is light enough to be airborne but heavy enough to carve out a flying field in rough country. It can be used as a bulldozer, scraper, dump truck, or grader. It's a carrier for troops, cargo, or weapons. It can operate such equipment as crane booms, conveyor belts, winches, and earth augers. It travels both

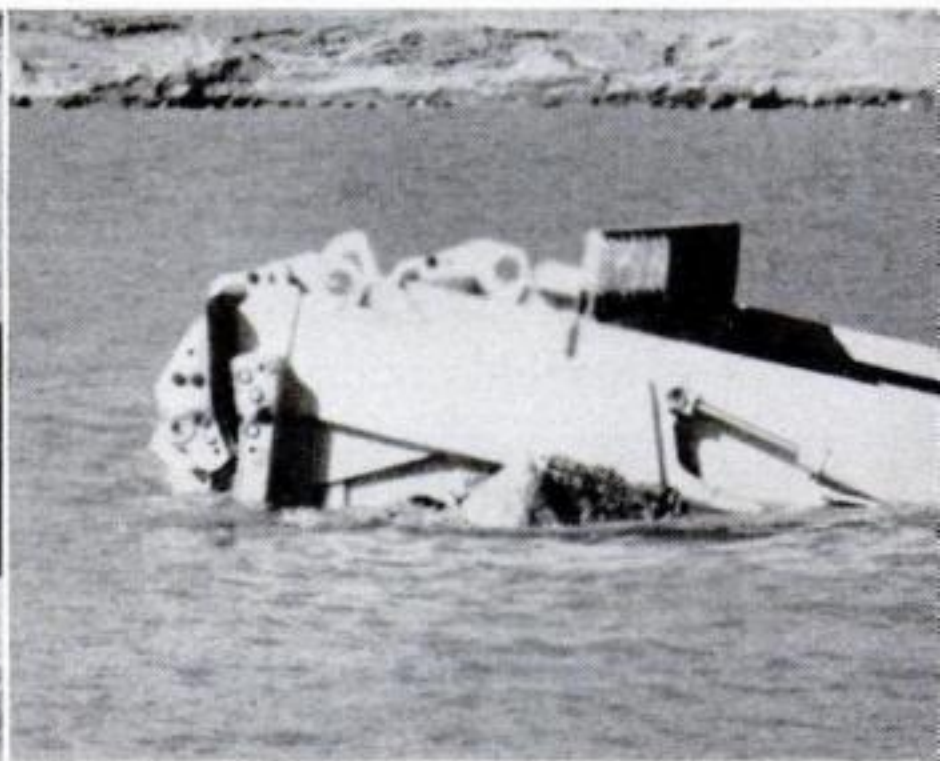
on and off the road, fords six-foot streams, and, with the cleats on its tracks spinning around its ten wheels like the paddles on a river side-wheeler, swims in deep water.

Army engineers testing the vehicle at Fort Belvoir, Va., think it may eventually replace 119 different pieces of conventional specialized equipment. This would ease a

. . . transports troops and equipment . . .



. . . swims rivers and lakes with





. . . pushes it around with dozer blade . . .

logistic problem by reducing the number of parts required for field operation from 161,160 to 2,040.

Key to the flexibility of the UET (Universal Engineer Tractor) is a hydropneumatic suspension system. Devised by International Harvester, it enables the operator to turn the springs on or off with a control handle on the dash: on, for highway-convoy speed of 30 m.p.h.; off, for solid earth-moving or to make a firm mortar mount. Each of the eight driving wheels is individ-

ually sprung with hydraulic rotary actuators and gas springs called accumulators. Disconnecting actuators from accumulators unsprings the tractor. Aluminum construction makes the tractor a lightweight.

Loading the bowl with 7.4 cubic yards of earth or other ballast—which the vehicle can take on itself—doubles its two-ton airborne weight and provides a 17½-ton drawbar pull, equivalent to that of a conventional tractor twice its size. The load can be ejected by a hydraulic gate.

engine in back and nose up . . .



. . . puts on speed on level ground.

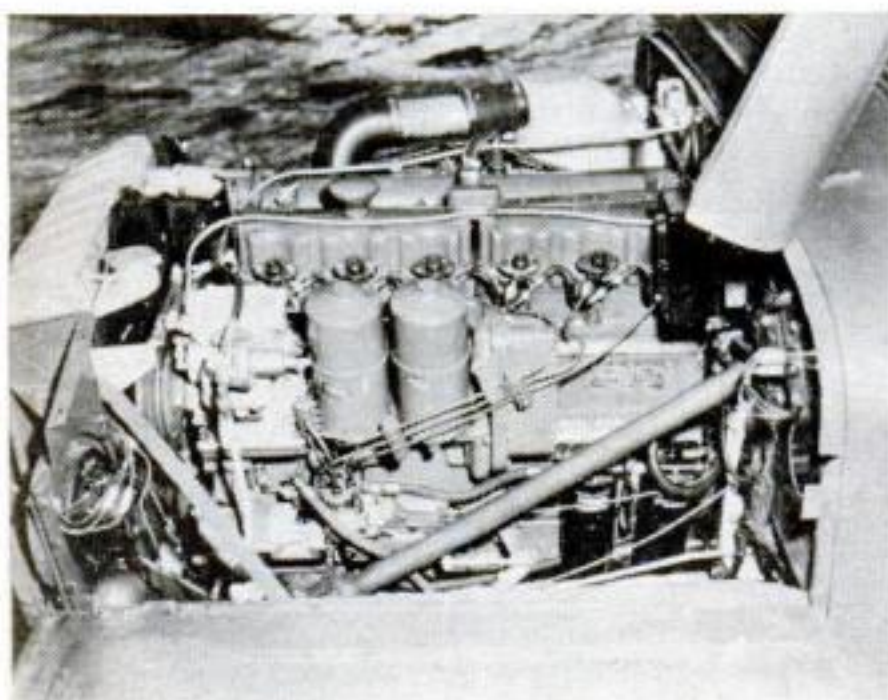




Float-in restaurant feeds boatmen

When the fish are biting and you have neglected to pack a lunch, you need no longer go hungry or come back to shore. An enterprising boatbuilder in Tremont, Ill., is turning out outboard houseboats that are floating restaurants. The first opened this

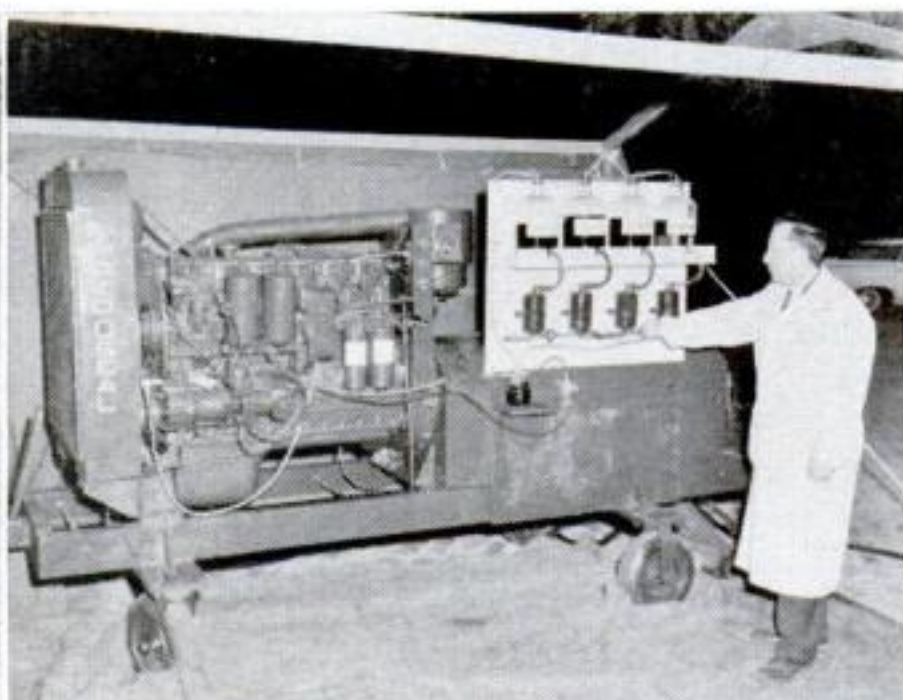
summer on Lake Peoria and is doing a thriving business with hamburgers, hot dogs, and more substantial fare—with boat-hops taking and serving orders. By next summer, Maid of the Mist Houseboats, Inc., expects to have its float-ins operating on inland waterways around St. Louis, Dallas, New York, and Baltimore.



Multifuel engine installed under hood of Army M35 runs on variety of fuels to simplify logistic problems in combat or on maneuvers.

Multifuel engine runs Army trucks

An engine that operates on any kind of fuel that's around—gasoline, kerosene, crude oil, diesel, or jet fuels—is now in volume production for the Army's 2½-ton M35 truck. The Hypercycle engine was developed by Continental Motors and Army



Test mounting of engine connected to multifuel panel demonstrates smooth performance on gasoline, diesel oil, jet fuel, or mixture of three.

Ordnance. It's equipped with an American Bosch cam-actuated injection pump with a plunger that reciprocates to pump and rotates to spray fuel against the wall of the combustion chamber. Air is swirled in through a special port to promote burning at the evaporation point. The engine has been tested in arctic cold and desert heat.



Cars stand up for a ride

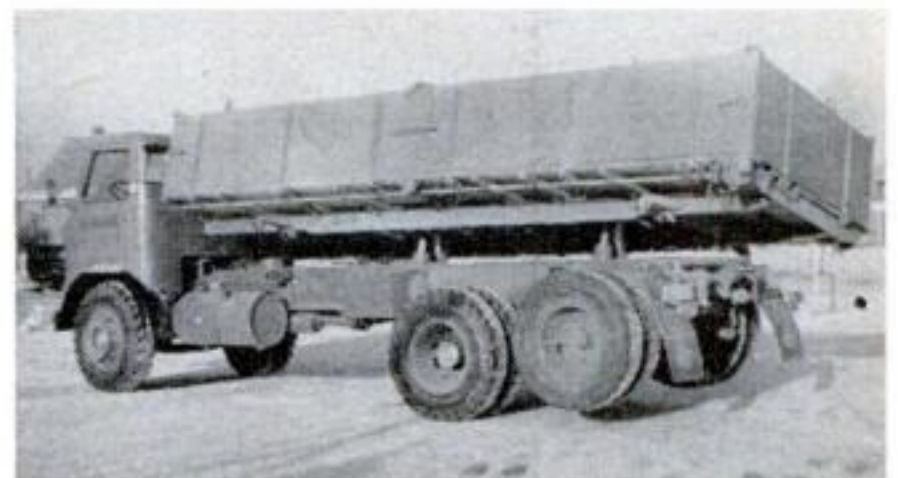
Like soldiers in formation, 16 automobile bodies are carried daily on a special transporter from the BMW factory in Munich, West Germany, to an assembly plant in Ant-

werp, Belgium. A dozen bodies stand on end on the low-slung trailer and four more on their sides on the truck roof. Engines, transmissions, suspension units, and other parts are stored under cover in the truck body. The 500-mile trip takes 12 hours.



Portable fire-fighting tanks

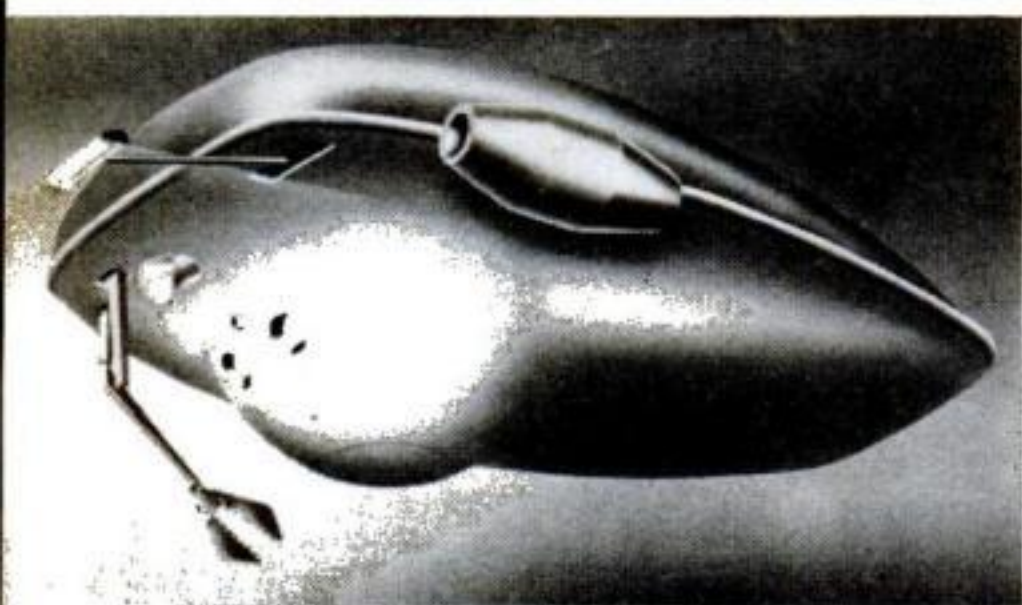
Loggers in British Columbia use portable water tanks to minimize the threat of forest fires. Crown Zellerbach devised the two shown above. Each can be filled with 2,000 gallons and trucked into the woods with the loggers. One is a big cylinder, the other a flat steel box. Set on stands high enough for a logging truck to back under them, the tanks, with the legs swung up, are hauled out to the forest with logging crews. Working nearby, they can douse a fire before it gets a good start, move on with the tanks as they cut new areas.



Retractable-axle truck

The trailing axle of this three-axle Danish truck can be raised for two-axle riding when the truck is empty, to reduce tire wear and rolling drag. Or when the 14-tonner is running loaded on loose gravel or soft ground, the third axle can be hiked up slightly to increase pressure on the driving wheels and thus provide more traction. A pushbutton in the cab controls the hydraulic ram that positions the third axle while the truck is on the move. Originally a standard British model, the conversion was made by the Copenhagen distributor.

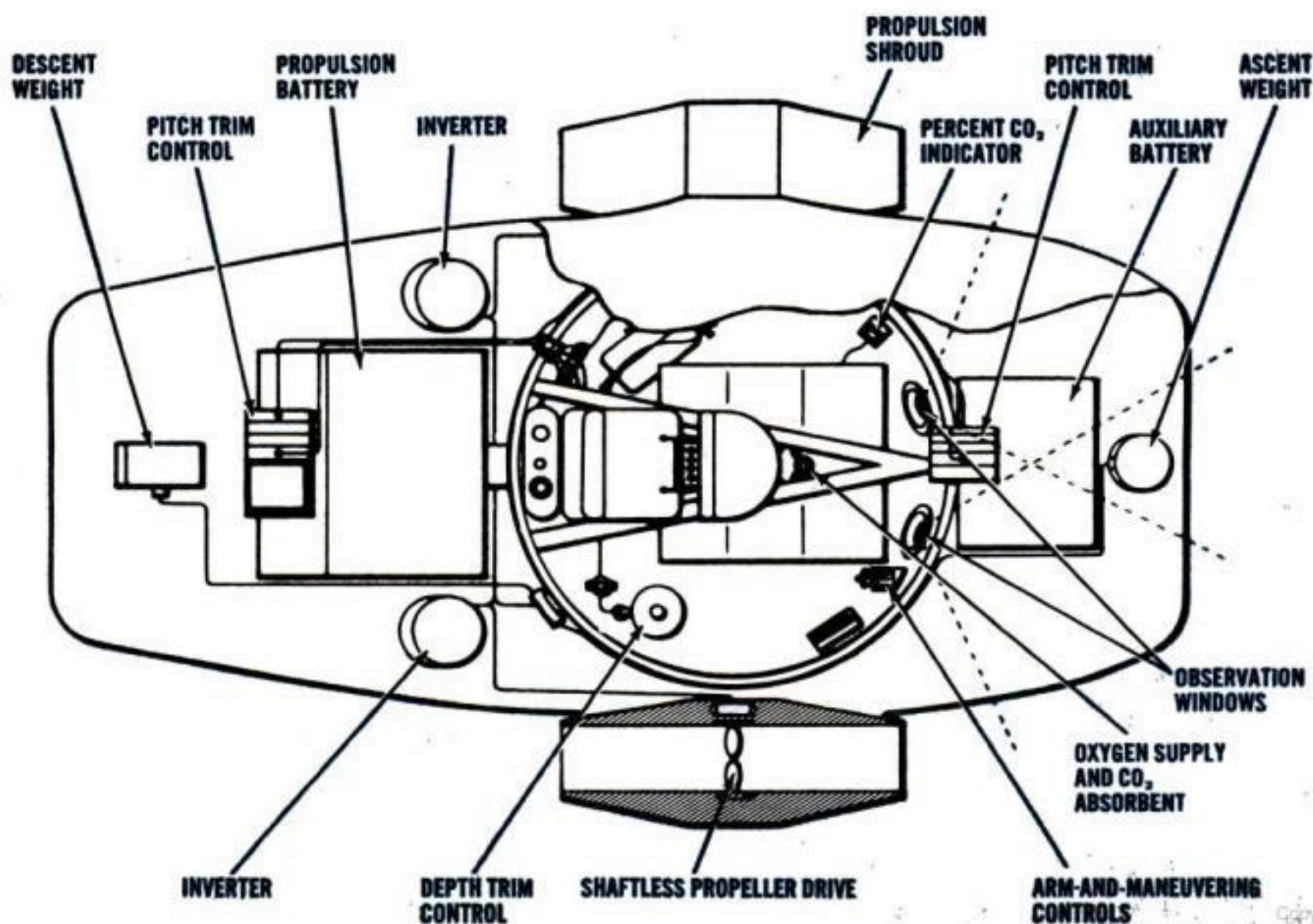
To the Bottom of the Sea in a Saucer

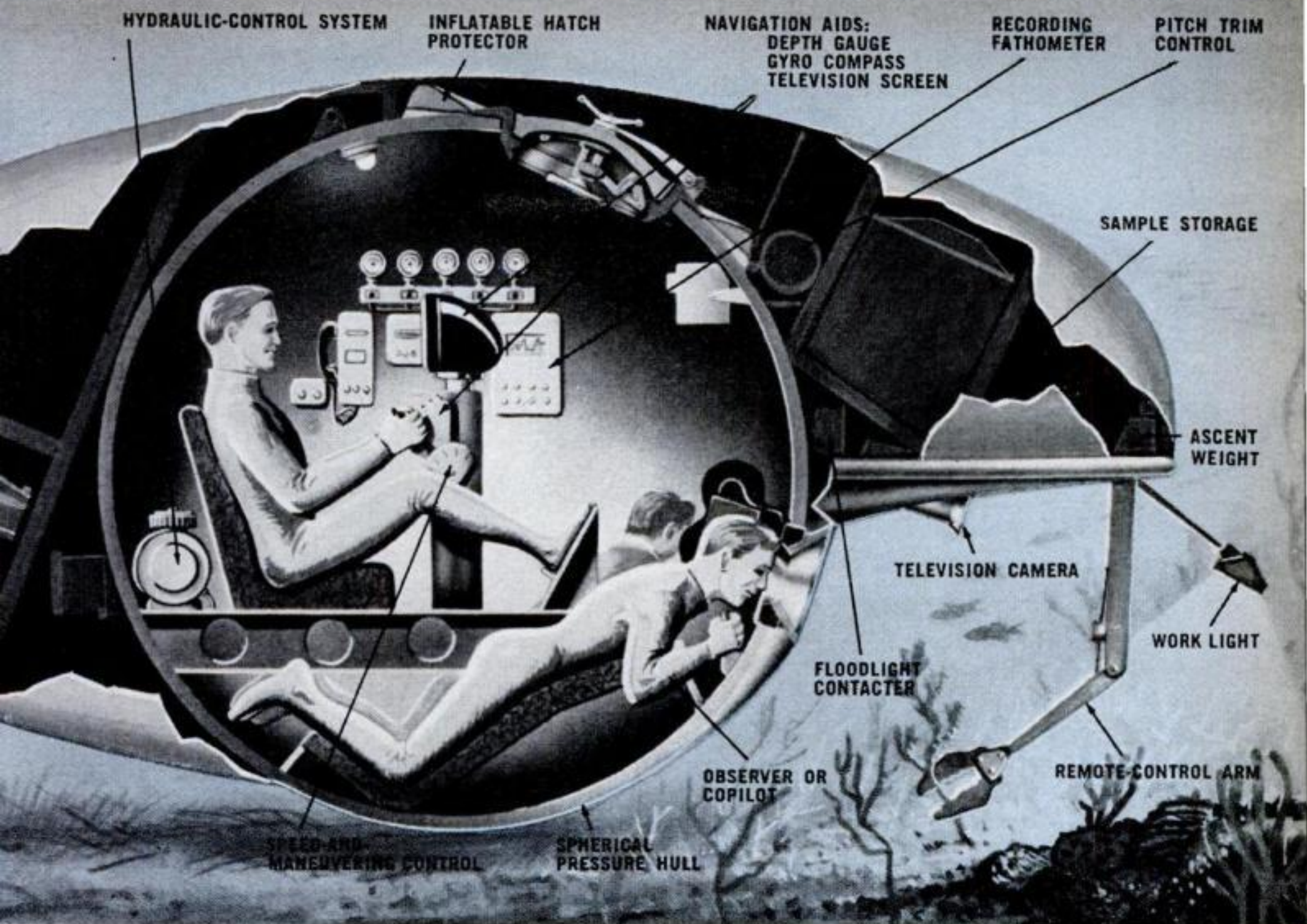


Propulsion pods and remote-controlled arms are shown in the artist's conception (above).



Vessel will have two parts, a thin outer shell to give it streamlined shape and to house pro-





pulsion and control machinery, which will be flooded to equalize pressures; and a spherical

cabin built to withstand the enormous pressures (2½ tons per sq. in.) at 12,000 feet down.

“Inner-space” ship to explore Earth’s last frontier—the mysterious three-quarters of the surface under the sea

By Hubert Luckett

THIS self-propelled diving saucer, under construction by Westinghouse, will enable a three-man crew to work 12,000 feet under the sea. Its maneuverability, freedom from surface ties, and ability to perform tasks outside the vessel, make it unique among deep-sea exploration vehicles.

Designer of the Deepstar is Capt. Jacques-Yves Cousteau, inventor of the Aqua Lung. He already has a similar vehicle operating down to 1,000 feet.

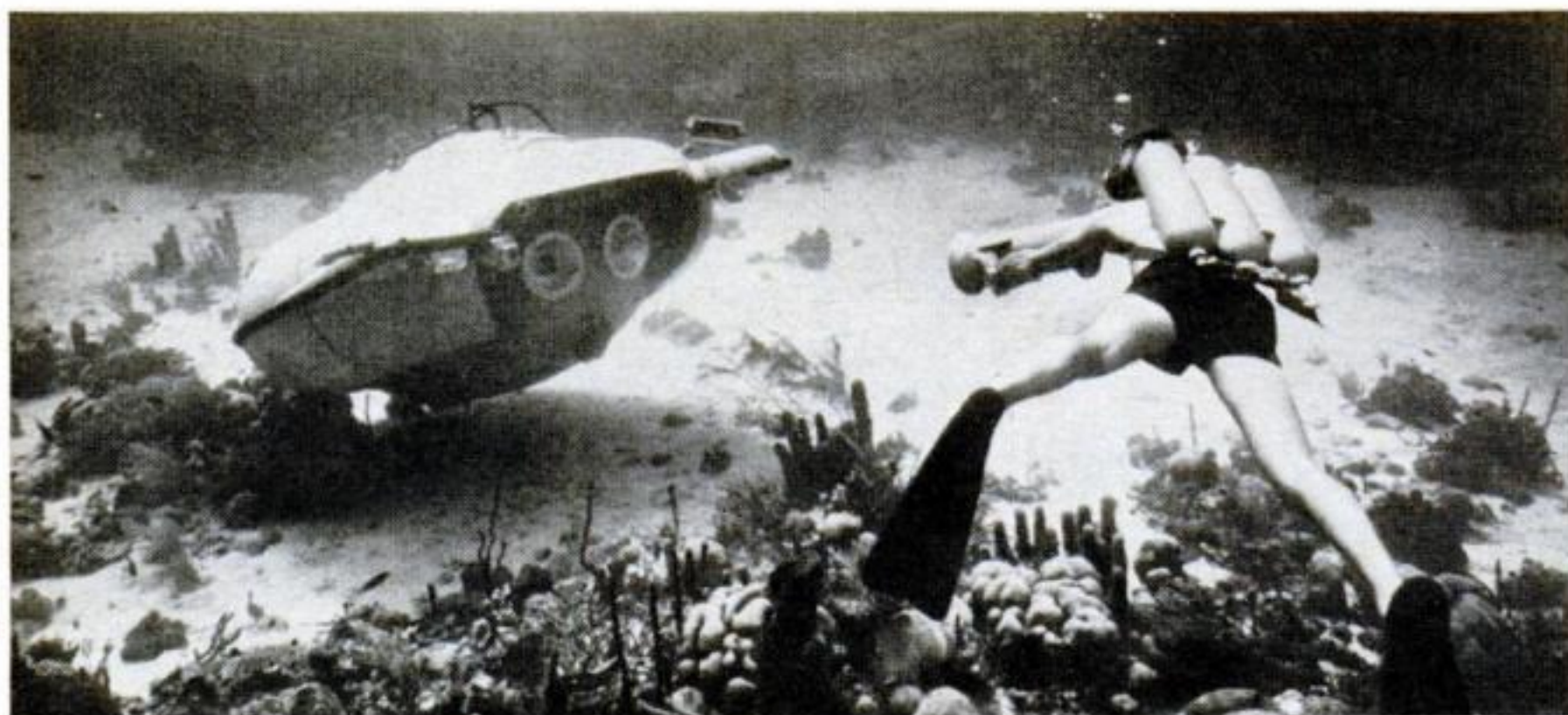
Although Westinghouse doesn’t foresee a booming drive-yourself business, it does plan to lease the vessel to organizations with undersea chores to do (when

Westinghouse isn’t using it for its own research). It will even build you a custom job for about \$500,000, stripped.

The vessel is expected to do many jobs at extreme ocean depths that cannot be done by any of the deep-sea research craft now around. Among them:

- Placement, observation, and recovery of instruments on the ocean floor.
- Taking samples and cores from the ocean bottom.
- Working on undersea communications cables and pipelines.
- Carrying out deep-sea salvage.
- Handling certain undisclosed military operations.

The main structural members of the seven-ton vessel are a steel ball six feet



Forerunner of Deepstar, designed and built by Capt. Jacques-Yves Cousteau, is shown here

at work. It has made 65 successful dives, can operate to 1,000 feet down at speed of $1\frac{1}{2}$ knots.

in diameter and a hydrodynamically shaped cowling surrounding it. As the inside of the cowling will be flooded, only a thin shell is needed. Walls of the ball will be $1\frac{1}{4}$ -inch-thick steel.

The ingenious propulsion and steering system uses shaftless propellers on either side of the hull. The props are, in effect, the rotors of a squirrel-cage induction motor. They are centered magnetically with fore and aft thrust rings for forward or reverse running. The stators, or fields, of these direct-acting motors form streamlined propeller tunnels. The motors are powered by 120-volt batteries operating through two DC-to-AC solid-state inverters. The frequency, and thus motor speed, is pilot controlled.

Steering is much like that of a crawler tractor—the vessel can pivot on its own center by reversing one prop. When underway, directional control is maintained by an autopilot that varies the speed of one motor.

At operating depth, the Deepstar will be neutrally buoyant. Releasable ballast will provide for descent and ascent. Attitude in the water will be controlled by a system that pumps mercury back and forth between forward and aft tanks to quickly tip the nose down or up.

She will dive with her nose straight down, ascend nose straight up, taking advantage of the streamlined shape to

speed the trip. The estimated 40 minutes it will take to reach an operating depth of 12,000 feet is one of the big advantages the Deepstar has over other slower deep-sea exploration vehicles.

In operation. A mother ship will take the craft to its diving area. Small enough to be carried on deck and lifted by the ship's crane, the Deepstar will be 17 feet long, 12 feet wide, and 8 feet tall. Underwater cruising range will be about 24 miles, speed about 3 knots. After a 24-hour operating period it will surface to recharge the batteries.

Propulsion and control machinery is in the flooded portion of the cowl, leaving the inside of the sphere clear for the crew and scientific instruments. A closed-circuit air-supply system is adequate for 48 hours.

In addition to special instruments for a specific job, these accessories will be built in: a gyrocompass; three echo sounders that "look" up, down, and ahead to measure distances to obstacles; movie camera; flash still camera; TV camera; two-way radio; and tape recorder. Outside the sphere there will be a hydraulically controlled lamp arm, a mechanical hand that will extend six feet, and a sample basket. The crew will be able to see what they are working on through two four-inch-thick Plexiglas windows. ■ ■

The Other Fellow's Job



He "ruins" gem diamonds

Drilling holes in diamonds is the job of 43-year-old Sylvestro (Sal) Altieri, an employee of the Bulova Watch Co. Some of the world's finest copper wire is then drawn through these diamond dies to make mainsprings and electronic-wristwatch coils.

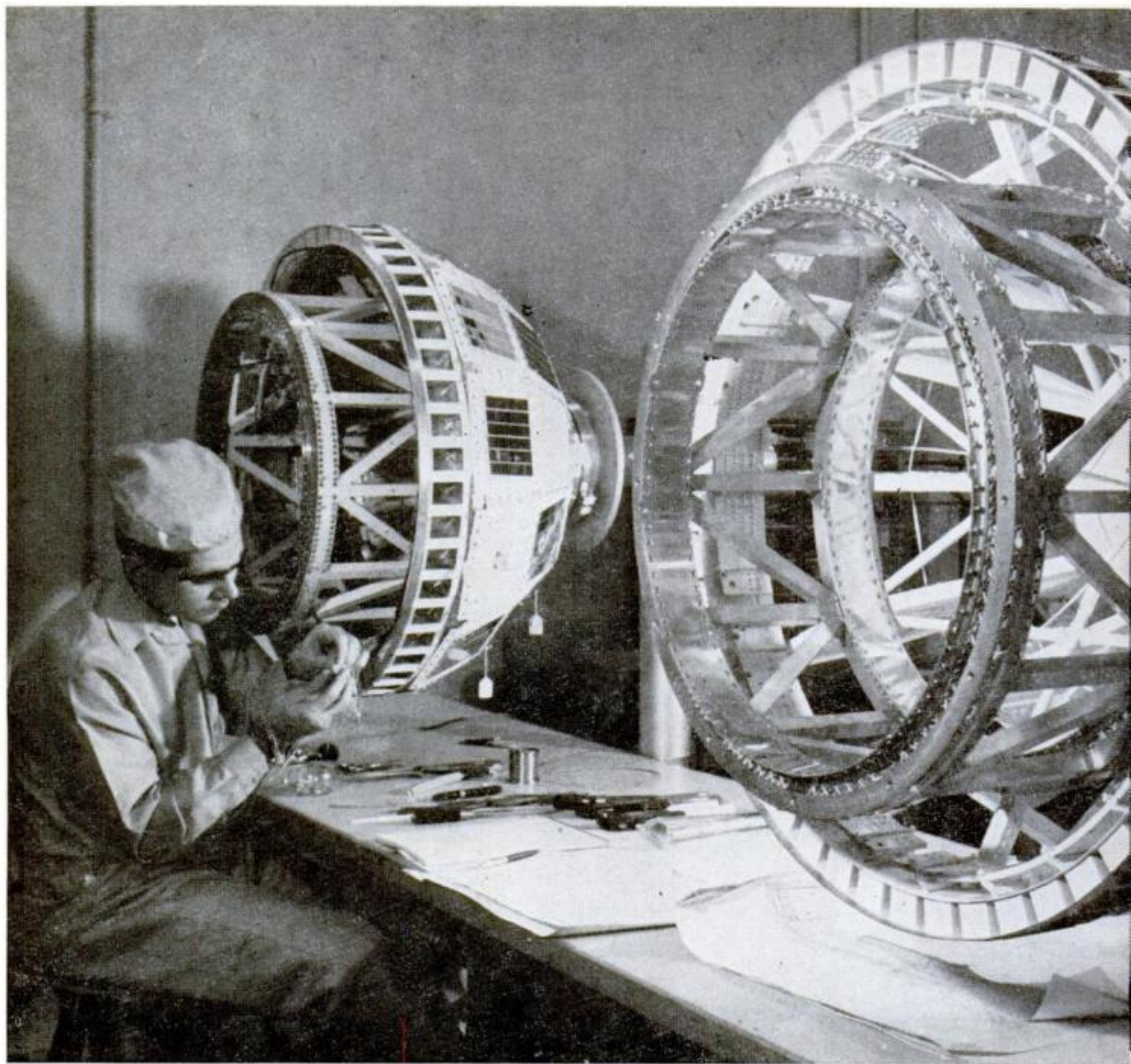
Only gem-quality stones are used. Industrial diamonds, though cheaper, could have flaws that would ruin the die. To save on cost, Altieri seeks odd-shaped stones with too much waste for jewels.

The die is formed by first grinding two parallel faces. Altieri then makes a polished window facet at right angles so he

can look into the stone with a microscope and watch how the hole is progressing. Holes are cut with a series of pastes made from increasingly finer diamond dust. Drills, on which the paste is applied, are shaped from ordinary sewing needles—an inexpensive source of high-grade steel of approximately the right size and shape.

To get into the field, you need about six years of practical training. A good man, says Altieri, makes \$6,000-8,000 a year.

Altieri is married and has three sons. He likes his job, he said dryly while examining a fractional-carat diamond, because it involves "no heavy lifting." What does he do for exercise? He bowls.



Telstar satellite wireman

The space-age structures that Salvatore C. Farina is wiring up are the lower hemispheres of two models of the Telstar experimental communications satellite. In all, four were made. One of these, placed in orbit this summer, has been relaying telecasts between Europe and the United States with exceptional clarity.

The slotted equatorial ring is one of the satellite's broad-band communications antennas. Most of the electronic components will be contained in a canister that fits in the center of the satellite frame. Assembly

is done in a superclean room to assure maximum working reliability.

Farina lives in Newark, N. J., and works in the Bell Laboratories in nearby Hillside. He's 23 and engaged to be married.

A 1957 graduate of West Side High School in Newark, he attended Rutgers University for one year. Wiremen like Farina earn from \$85-112 a week. When promoted to senior wireman, they can expect \$124.

He's now taking night courses at the Newark College of Engineering and hopes to earn an electrical-engineering degree in the near future.

Texas Tower man

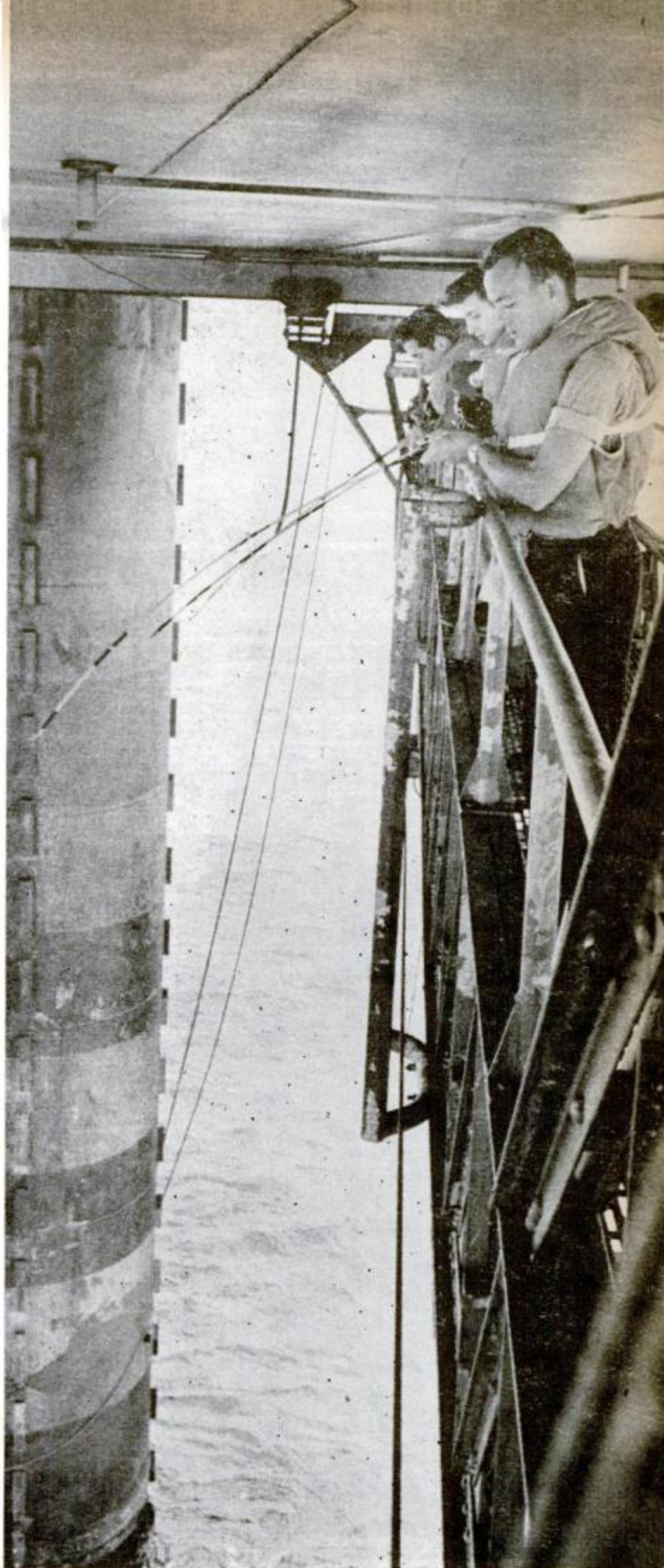
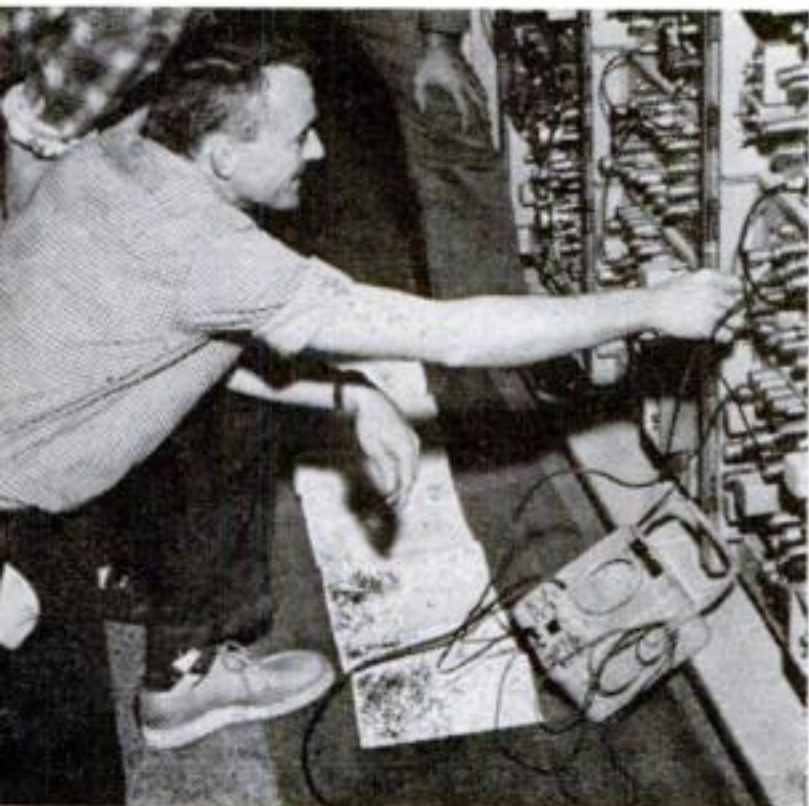
When a guy's favorite hobby is fishing, it helps if he can get a job around water. George C. Schmitt is surrounded by it. He works on a Texas Tower, a 90-foot-high radar site standing in the Atlantic 35 miles south-east of Nantucket Island.

Schmitt is a transmission supervisor for AT&T's Long Lines Department. He and three other telephone technicians work with 60 Air Force men on the Tower.

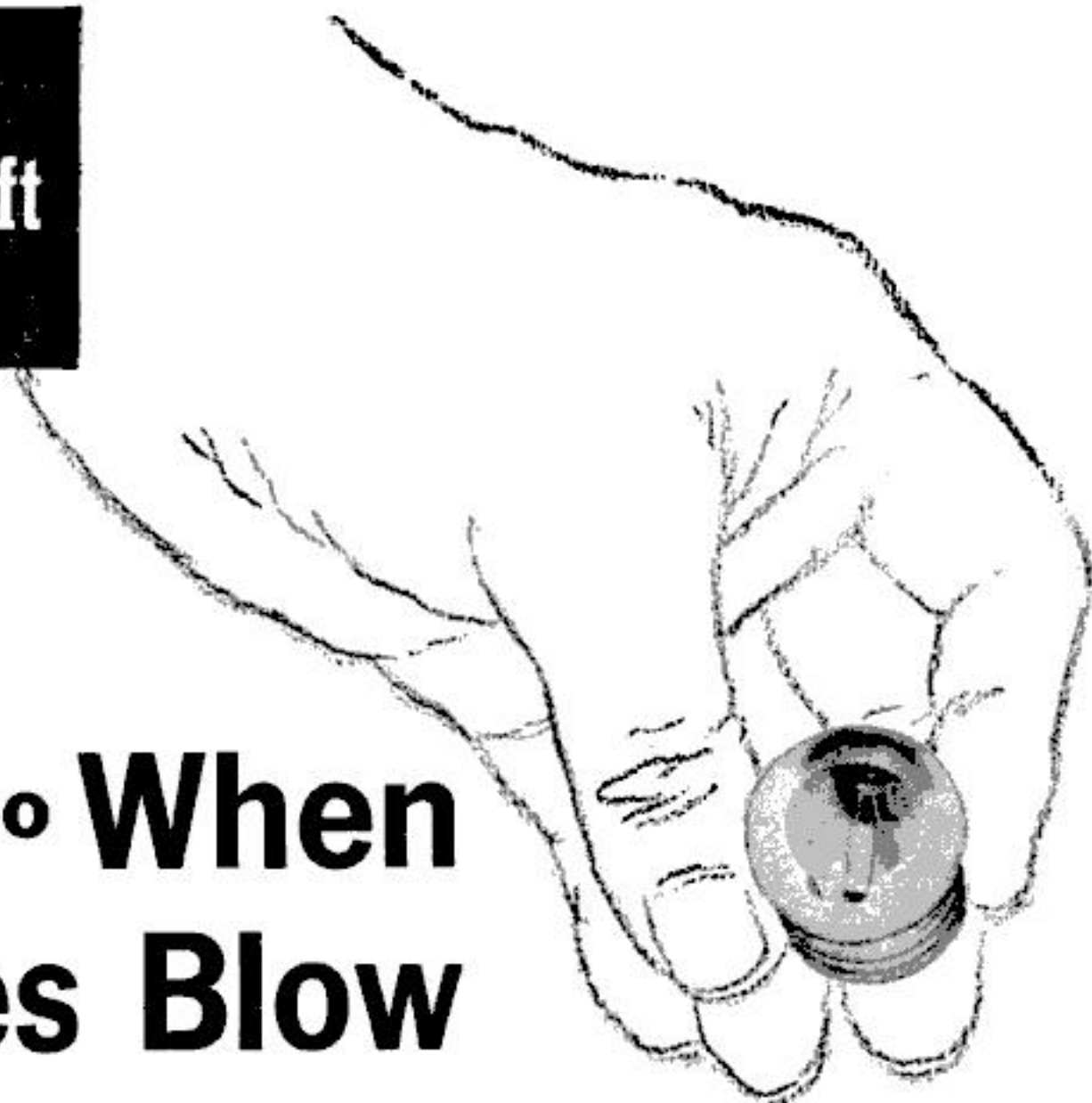
He is responsible for operating tropospheric-scatter radio equipment that provides communications with the Air Force network on the mainland. This equipment bounces radio waves off the ionosphere—a region of electrically charged air that starts about 25 miles up—permitting television and telephone communication across great distances over open water.

Schmitt spends a month on the isolated outpost, then gets a couple of months' shore duty. To qualify for the job, he studied at RCA Institutes, went to Fleet Sonar School in the Navy, and took radio and telegraphy courses at AT&T.

He's 31 and lives in Easthampton, N. Y., with his wife and three sons.



WHAT TO DO **When Fuses Blow as Motors Start**



Although this can be a danger sign, more often it's just a nuisance that you can easily overcome

By J. W. Rocke

THE average American household, it has been estimated, has about a dozen good-size motor-operated appliances. The man with power tools in his cellar has even more. These place a heavy burden on electrical circuits that often are already strained. So it's little wonder that blown fuses are an increasingly common nuisance.

An electric motor, in the nature of its current demands, is unlike most other electrical devices. When its rotor is not turning, it acts almost like a short circuit. The current doesn't drop to rated value until the motor reaches operating speed. Reason: A motor depends on the generator action of the turning rotor to generate a voltage that opposes the in-rushing current and to limit it to the required value. So even

though the name plate says your motor draws only 5 amps, it may be demanding 10 times this when you first throw the switch. And, of course, anything that drastically slows or stops a running motor will cause the current to soar.

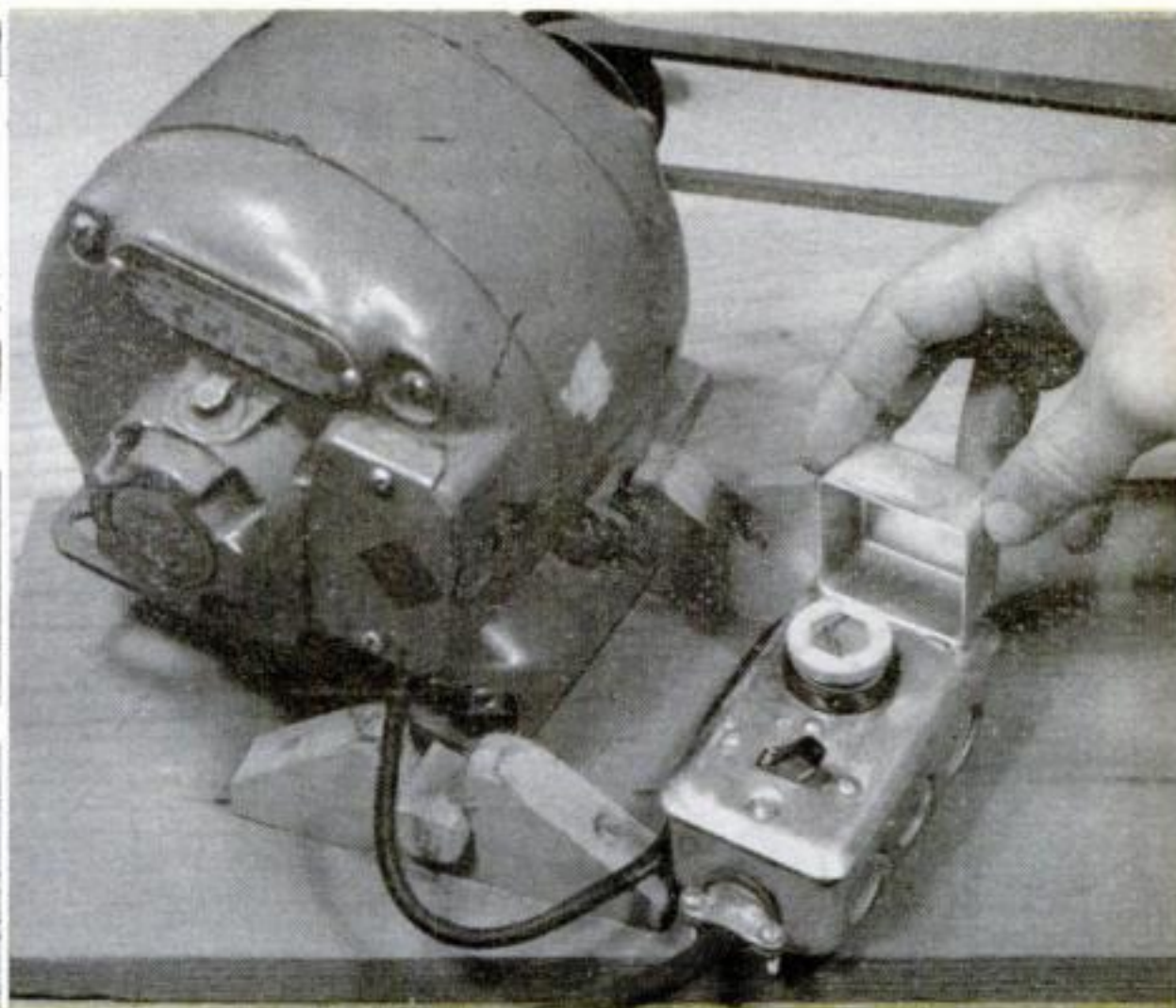
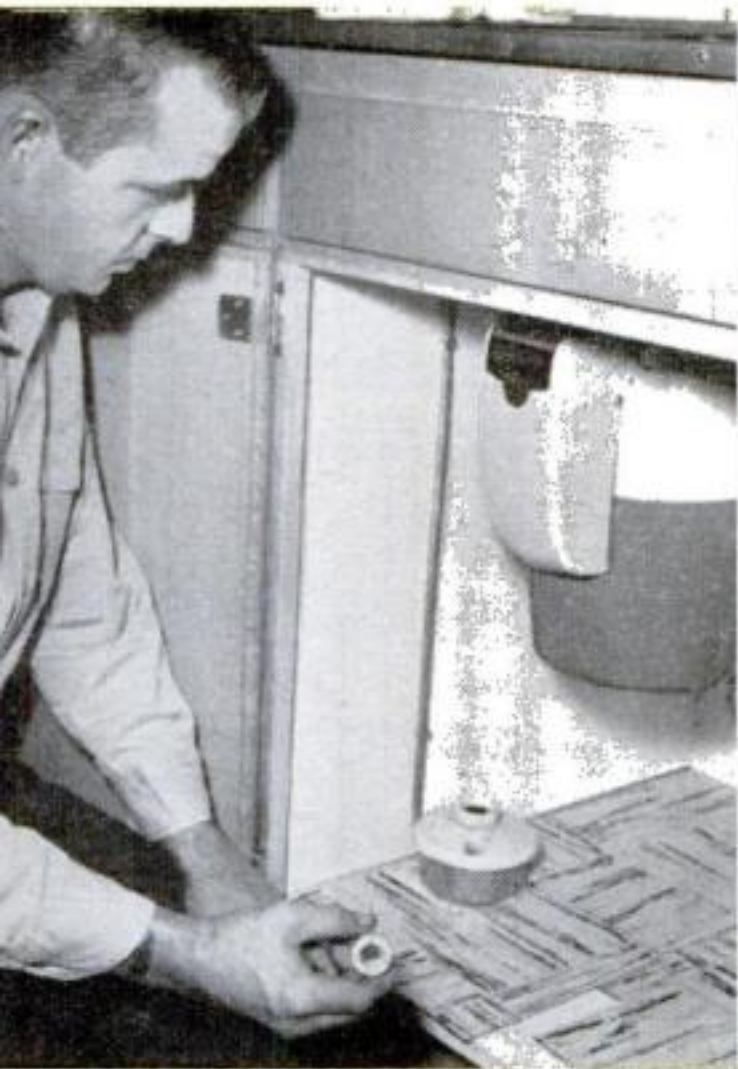
Most of your mysteries about blown fuses will be solved if you simply remember that a stationary or slow-turning motor rotor is practically a short circuit. A fuse is dumbly doing what it is supposed to do if it blows when you flip the switch on your new table saw or pinch the blade on a long rip cut.

Ordinary link fuses that are used to protect most home-wiring circuits just can't take more than the briefest overload. If the circuit is already loaded with other motors and appliances, the margin is even slimmer. (Houses with wiring protected by circuit breakers aren't so apt to have this trouble.)

You might try to remedy the situation by inserting a fuse of higher rating, but this is asking for trouble. It could cause a fire or let the motor itself burn out.

Fortunately there are a number of less

Motors need individual fuse protection



Individual fuses installed nearby are a wise precaution to protect motors—especially those that are often subjected to overload, as in a garbage disposer. Wire the fuse receptacle in

series with the hot (black) wire. You can wire a fuse receptacle in series with a plug-in motor cord if you use a polarized plug to insure that the fuse will be in the hot lead.

hazardous solutions, some of which are just as easy. One is to relocate some appliances instead of concentrating your heavy-draw equipment on one branch circuit. Or try to stagger their use so they're not all going at the same time.

Time-delay fuses, however, are your best bet in the easy-fix department. These fuses (which can be easily fitted into standard sockets) are designed to take momentary overloads. But they blow—as good fuses should—if their capacity is exceeded for long. Installed in the main box, they eliminate the nuisance of replacing fuses blown by motor starts.

For even greater convenience—and better protection—you can install time-delay fuses in individual motor circuits. They are available in odd sizes to match most common motor loads. A fuse with the same current rating as its motor (or just slightly higher) will carry normal starting loads. In the event of a motor overload or mechanical trouble, it will blow before the motor comes to harm.

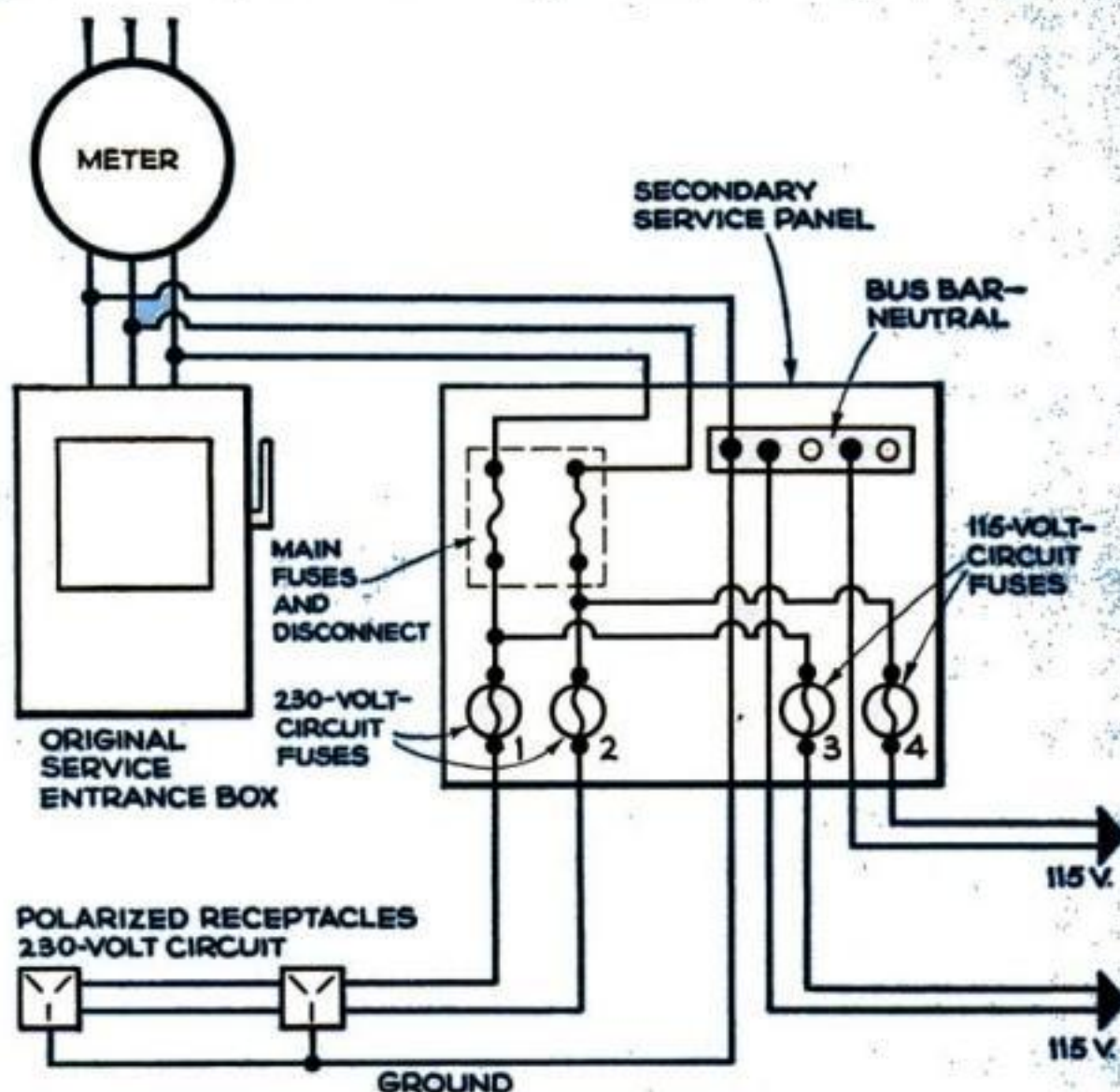
The National Electrical Code recommends that an individual-motor fuse be



Many motors have built-in overload protectors. If a motor quits under overload, remove the cause, let motor cool; push in reset button.

installed in the ungrounded leg of its power line. If the motor is to be plugged in—rather than permanently wired—to the power line, it needs a polarized (usually three-prong) plug. Otherwise the fuse has a 50-50 chance of ending up in the grounded line, which would make it ineffective if a physical ground completed the circuit.

If you have outgrown your home's electrical system, here's what you



A three-wire drop from the power pole usually indicates adequate power available for an added distribution panel. Existing circuits are left undisturbed and a new combination service

switch, fuse box, and distribution box are added to feed additional branch circuits. New boxes vary in number of branch circuits, but wiring diagram above shows general scheme. A spe-

Mechanical faults cause fuse and starting troubles, too. A common problem is a sluggish or stuck centrifugal starting switch. The larger motors for home use are single-phase induction motors that require an extra winding to get them started. Once they reach about 75 percent of operating speed, the starting winding is no longer needed and is automatically cut out by a centrifugal switch. If this switch fails to *close* when the motor is stopped, the motor won't start the next time you turn it on—unless a fuse blows, the *running winding* will burn out. If the centrifugal switch fails to *open* when the motor reaches speed,

the *starting winding* will then burn out.

Main-box fusing doesn't give reliable protection against these hazards. An individual fuse—of correct value, properly installed—will save the motor and give you a chance to correct the defect by cleaning the switch mechanism.

Tight belts and extreme pulley ratios account for a majority of motor ills. Worn or dry bearings (an ailment common to elderly sleeve-bearing motors) cause a similar condition. The result is a slow-starting motor that takes too long to, or may never, reach operating speed. Regular lubrication, looser belts, or less severe step-up pulley



How a time-delay fuse works

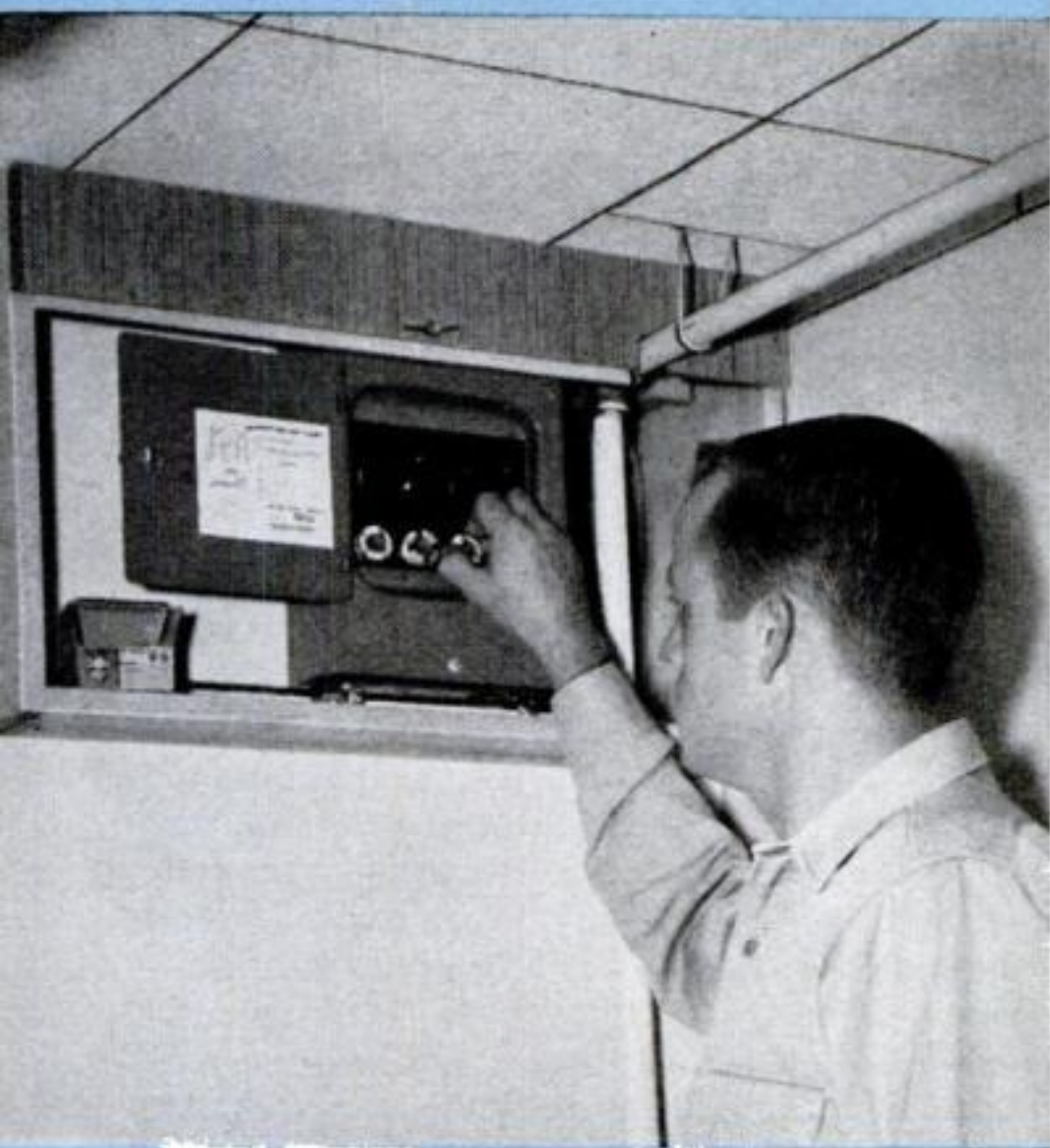
Time-delay fuses have two elements. One is like the link in an ordinary fuse and blows if there is a short circuit, disconnecting the line.



The second element is a button held in soft solder. On overload, the heat melts the solder and a spring pulls the button away from contact.



can do about it



cific wiring diagram will be in the box. For a shop with several power tools, it's a good idea to set up a secondary distribution center in the shop with a circuit for each motor.

ratios solve most such problems for you.

Match the motor to the load when shopping for a new or replacement motor. Mismatching will cost you more to operate and is often a source of motor trouble. An underrated motor may seem to do the job, but it will use more current for the same work and is more apt to give trouble. The starting load makes a big difference in the kind of motor you should choose. With a light starting load, you can get by with a cheaper type.

Split-phase and capacitor motors are the most common household types. They are similar in appearance but differ in efficiency and the amount of torque (twisting power) they can exert on start.

Split-phase motors, the cheapest, are almost always used on easy-to-start appliances such as attic fans, dishwashers, and clothes dryers. It can deliver only about $1\frac{1}{2}$ times its full-power torque to get the load started and it draws an excessively high starting current if it meets very much opposition in getting under way.

Capacitor motors have a much higher starting torque and a lower starting current. Such a motor also delivers more horsepower per watt when running. It gets its name from a large capacitor wired in series with the starting winding. The capacitor makes the same current work harder by improving the working relationship between the motor windings. Since it has a lower starting current in proportion to load, the capacitor motor is much easier on fuses.

Help from motor accessories can sometimes end knotty fuse-blowing problems. The trick is to increase a motor's starting efficiency electrically, mechanically, or both. For example, by wiring a capacitor in series with the starting winding of a split-phase motor, you can give it some of the easy-start characteristics of a capacitor motor.

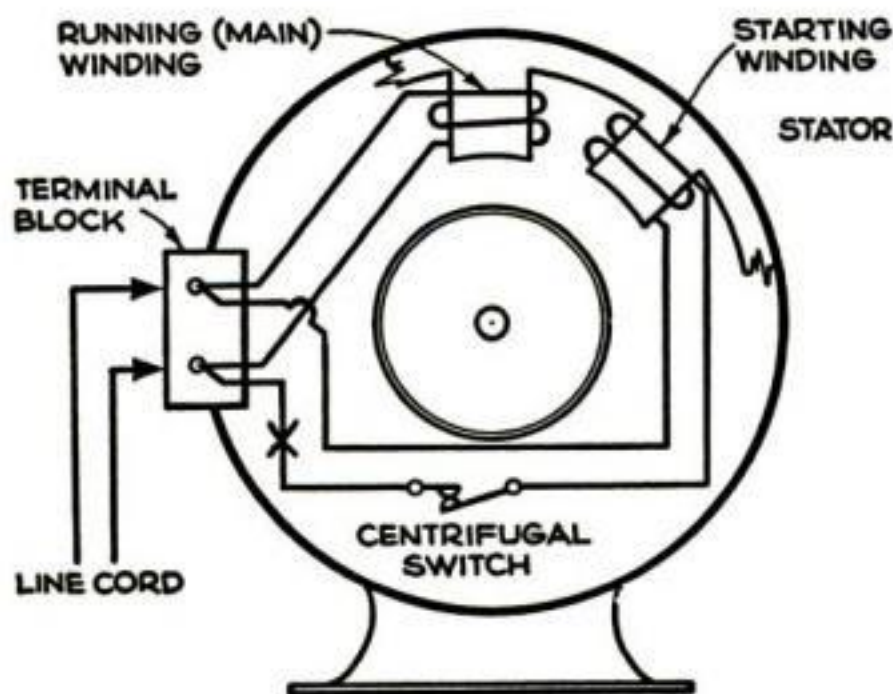
Motor-repair shops and radio-supply houses stock standard motor capacitors. Capacity, measured in microfarads, isn't critical as long as it's not too low for efficient starts. A capacity of 80 mfd. and up is suitable for most fractional-horsepower motors. But make sure the capacitor's voltage rating is at least equal to the 115 (or 230) volts the motor runs on.

Installing a centrifugal clutch between a motor and its load can overcome some starting problems. The clutch lets a motor get up to speed before hooking on its load. Long used on automatic washers, centrifugal clutches make it possible to power high-speed equipment with smaller, lighter, less expensive motors.

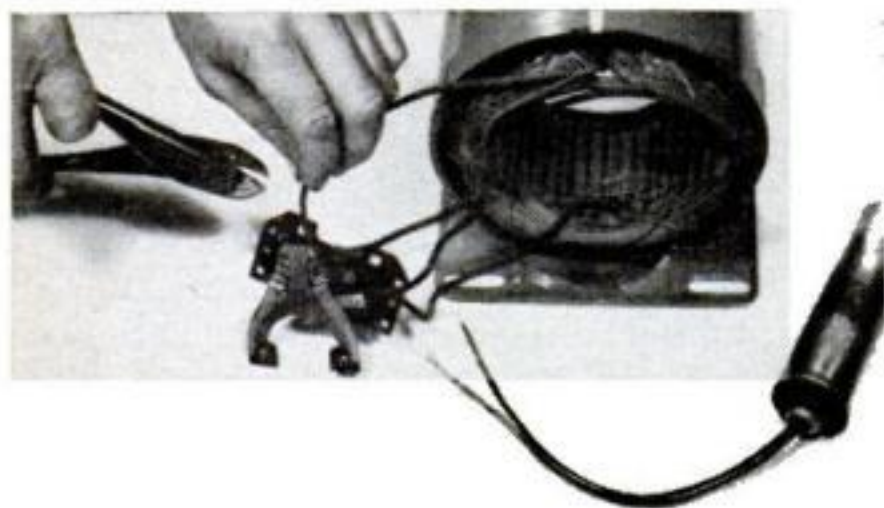
Fuse-blowing is one symptom of overloaded or heavily taxed circuits. But sluggish motor operation and slow-heating appliances are also signs of a low-voltage condition. When this sluggishness affects an individual motor controlled by remote or multiple switches (as in a garage-door opener) the trouble is probably due to voltage drop in the extended switch-to-motor line. You can correct it with an external motor starter.

The starter unit, sometimes called a motor controller, should be located as near the motor as possible and connected to a local branch circuit. Current then makes a short trip to the motor through the starter's heavy-duty relay contacts. Start-stop switches, which control the relay, can be located as far away as you like. Because the relay needs very little current, you can stretch light-duty wiring to the remote switches without voltage-drop worries.

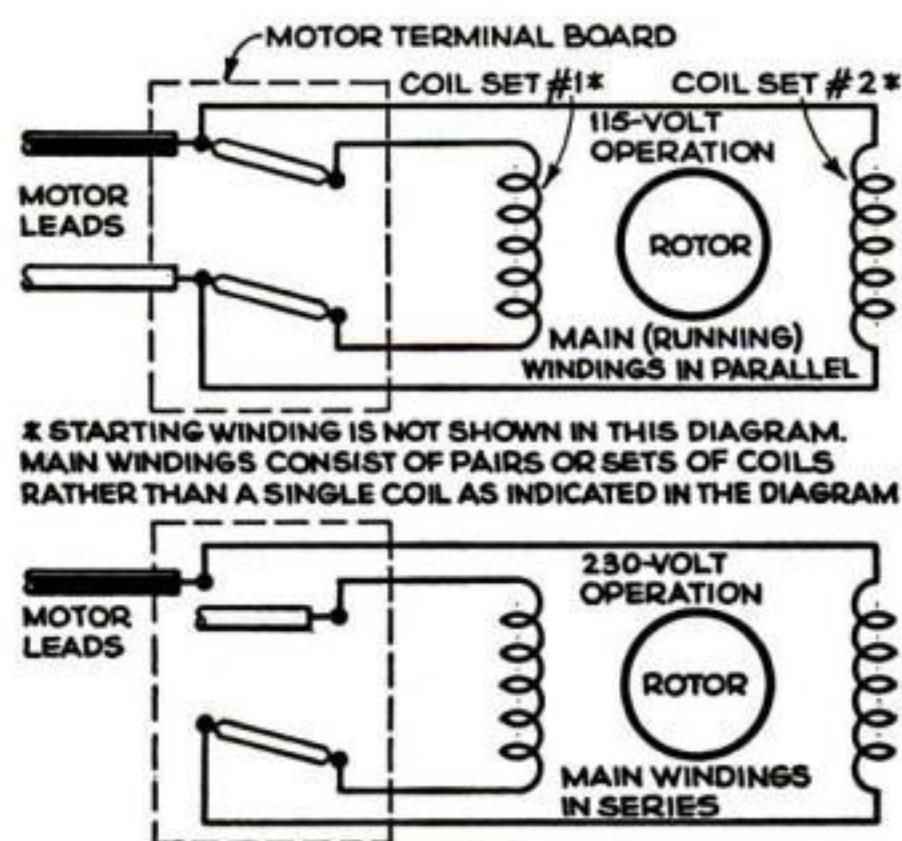
How you can reduce motor starting current



Split-phase motor wiring diagram shows how windings are separately connected to terminal block. Centrifugal switch disconnects starting winding when the motor reaches speed.



A motor-starting capacitor connected in series with the starting winding will reduce starting current. Clip the wire and connect it between one side of the line and the switch.



What voltage? Many motors are wired to run on 115 or 230 volts. They're less likely to blow fuses if you can run them on 230. Diagram shows how to change the connection.

A **power panel** may be what you need. If a number of your appliances are dragging their feet, or if you plan to add more motors to your already laboring circuits, a separate power-distribution panel may be the only answer. Fed directly from the meter, it can be wired to meet your long-term appliance and shop needs.

If you do install a secondary power center, aim for a 230-volt installation. Check the main cables (or service drop) feeding your house. A three-wire drop indicates a 230-volt service entrance that is probably adequate for added circuits. Check with your power company to make sure.

A 230-volt installation requires only one additional wire, and branch circuits can be wired to 230- or 115-volt outlets. With a few 230-volt outlets, you can get more efficiency out of both old and new motors.

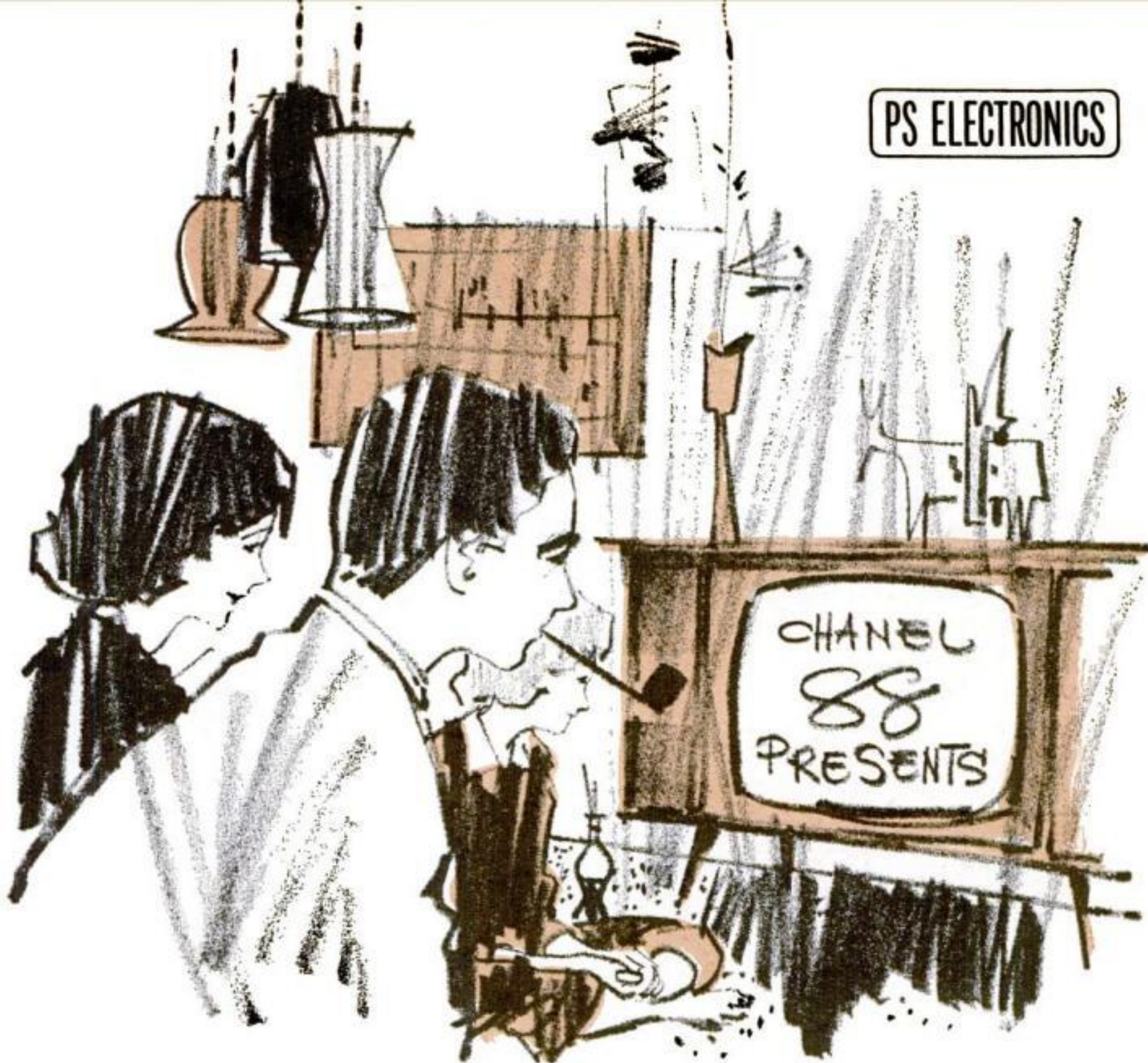
Motors and appliances draw half as much current (for the same power) at 230 volts as at 115, so circuits of any given wire size can handle twice the load. This means, among other things, that the distance from a current source can be increased without putting a motor on an electrical diet.

Many 115-volt motors rated at $\frac{1}{2}$ hp. or more can be converted to 230-volt operation by changing the running-winding leads from parallel to series connection. Lead identification may be given on the nameplate or inside the terminal cover; if in doubt, consult a motor repairman.

Portable power tools can create fuse problems, too. These are powered by universal-type motors—you can identify the type by the commutator and brushes. Unlike the induction motor, this type does not run at a constant speed, nor does it require starting windings. The operating speed varies with the load. (You'll also find universal motors on sewing machines, vacuum cleaners, food mixers, and some fans.)

A universal type will, for a time, try to pull a much heavier load than it was designed for. But if you prolong the overload, it'll get hot enough to burn the insulation or melt the solder connecting the wires to the commutator.

A good way to safeguard your tools is to install special fused receptacles over your workbench. Insert time-delay fuses closely matched to the rating of your tool as shown on the nameplate. They'll probably blow more often than if you depended on the main-circuit fuse, but they may save you the price of a new tool. ■ ■



COMING SOON:

More TV Channels for Everyone

All new sets will soon receive UHF as well as VHF. Here's what a new federal law will mean to you

By Charles Tepfer

YOU may be one of the many millions of TV viewers in the U.S. today who never touch the channel-selector knob on their set. You have no reason to. You have a "choice" of only one

station. Many millions more are limited to a choice of two or three stations.

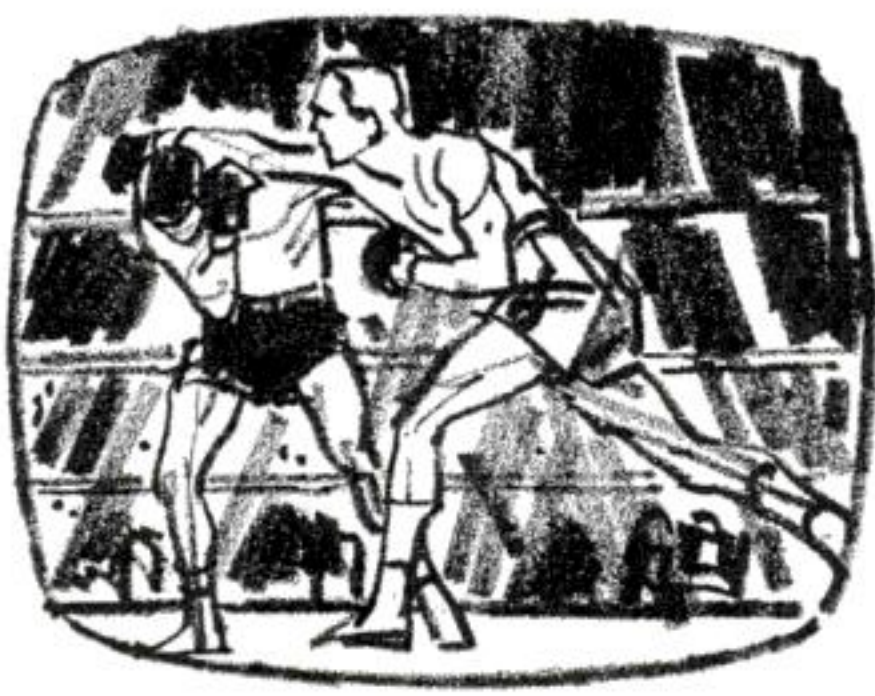
But in the near future you may have a handful of new channels to pick from. A bill that should make new TV stations sprout like flowers after a summer rain was recently signed into law by the President.

Manufacturers of TV receivers will have to stop producing sets that receive only very-high-frequency (VHF) stations, and will make only all-channel sets—which can tune in the ultra-high-frequency (UHF) band as well as the VHF.

As UHF comes of age, you'll see many new programs



Adult-education courses may cover science, literature, art, history, and farming.



Boxing matches and other live sports events may be available to pay-TV subscribers.

At this writing, the date this law goes into effect is still under consideration by the Federal Communications Commission. In fairness to TV manufacturers, enough time must be allowed for disposal of existing VHF sets and for retooling.

What is the UHF band? It consists of channels 14-83, operating on a single continuous band from 470 to 890 megacycles. The VHF band spans two frequency spectrums—54-88 and 174-216 megacycles.

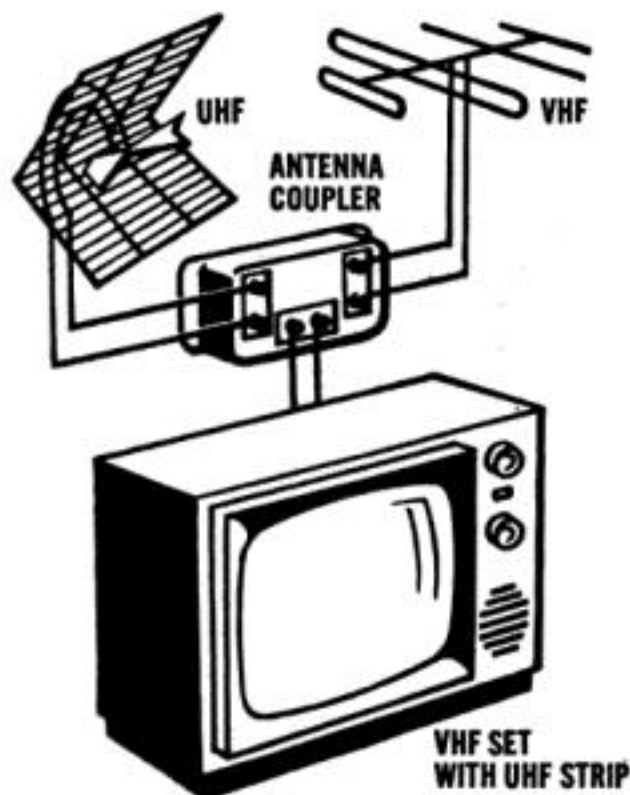
The higher the frequency of the signal, the smaller the wave length. The frequency

of channel 31 is 580 megacycles, which gives a wave length of about 20 inches. Channel 2's wave length is about 16 feet.

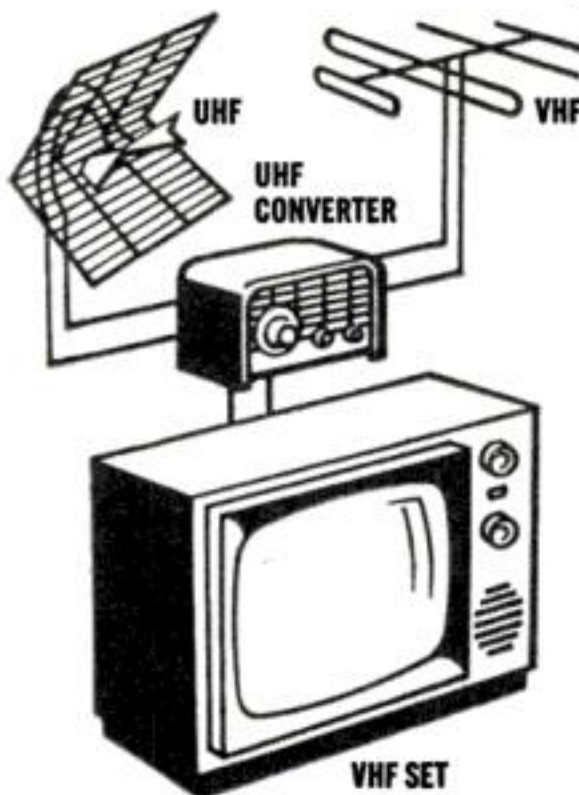
Why not add more VHF stations? You can't. Because the interference between stations would make television watching as chancy as picking the daily double.

UHF is much more limited than VHF. Within 25 miles of the transmitter, UHF reception is about as good. Past this distance, VHF holds up better—its signal can often be received up to 120 miles from the station. Why the difference? UHF waves

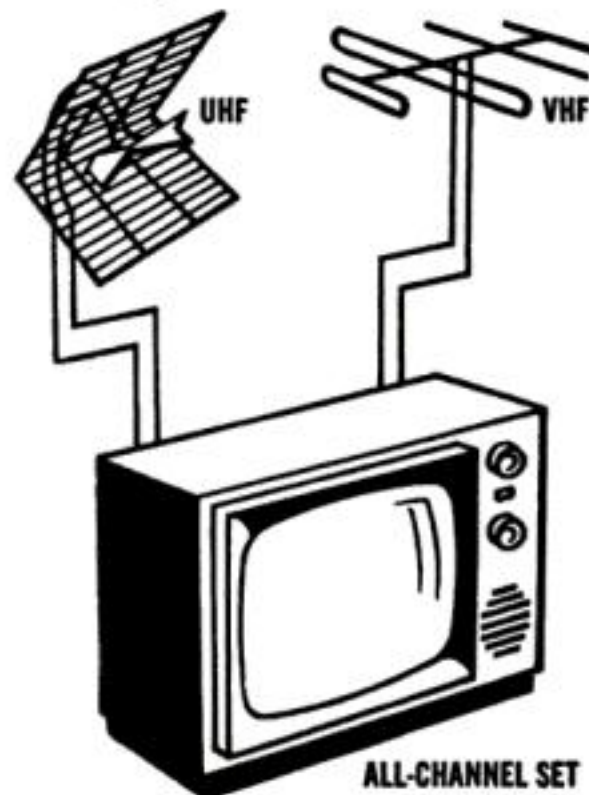
Like to have UHF-channel reception right now? Here are



If there's only one UHF channel in your area, equip your step-type VHF tuner with a strip circuit for that station. Drawback: If more stations are added, you'll need new strips.



Hook up a converter that steps down the frequency of UHF signals, allowing you to see them on channel 5 or 6. This setup takes care of all UHF channels. Cost: under \$30.



If you need a new set anyway look for an all-channel model. It has separate tuners for VHF and UHF. It usually costs about \$30 more, but you may find a bargain with canny shopping.

—but the police lineup will be closed to you



Municipal coverage may show civil employees at work: councilmen, police, or (above) firemen.



Foreign-language programs may appear in many large metropolitan areas and border cities.

act like light beams. They're stopped by obstructions, and they don't bend around corners. Their energy is diffused more easily over long distances.

No problem, say UHF proponents. There's no reason why a station in the heart of a city should be required to serve localities 60 or more miles away. Some big-city shows can still be made available to small-city stations by means of networks.

Why has UHF been neglected so long? Because the chances are that you haven't been watching these channels. Only 14 per-

cent of the sets now in use can pick up UHF channels. There are only 103 UHF stations in the U.S., as against 500 VHF stations.

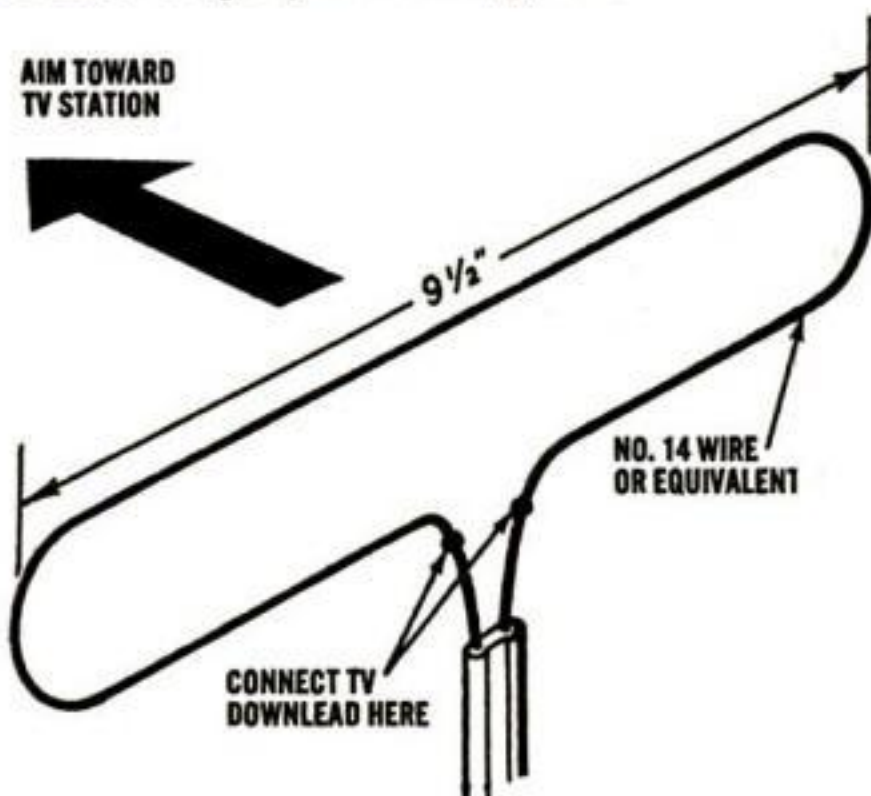
How will they get you to switch to UHF? By making it almost certain that within 10 years you will have an all-channel receiver. Eventually VHF-only sets will be as rare as iceboxes.

Will UHF programs be different? Probably. For one thing, there should be more educational, noncommercial programs. This doesn't mean only dry, classroom-type instruction. Hobbies, arts and crafts, and new farming techniques are very much a part of educational TV.

The same audience that enjoys foreign-language radio broadcasts may soon be able to watch foreign-language telecasts. Station KWEX-TV, channel 41, in San Antonio, Tex., already broadcasts popular Mexican shows for Spanish-speaking townspeople.

Are there any nonconsumer uses? Yes. Many local government agencies are especially interested. WUHF, an experimental station broadcasting on channel 31 in New York City for the past year, has already won over many formerly skeptical police and fire-department officials. Four times weekly it broadcasts the morning lineup of police prisoners—scrambled so that the home viewer can't see it—to 18 precincts. Recently UHF TV carried an artist's sketch of a suspected killer of two New York City policeman. The men were quickly identified and arrested.

several ways you can get it



You'll need a special UHF antenna with any of the setups shown at left. This "coathanger" type is easy to build. If you live near the station, you probably can get by with an indoor version. A tip: UHF is extremely directional. Positioning of the antenna is critical.

[Continued on page 200]

The Right

You may be wasting power or losing speed if you don't know how to make a choice

By George Daniels

A SLUGGISH runabout suddenly planes like a champion. A little utility that could never tow a skier suddenly does so with ease. The trick is accomplished the same way in both cases—switching to a propeller suited to the job. Even a small prop change can add up to 50 percent in power.

The forces involved when a prop turns are greater than most skippers realize. A typical 55-hp. outboard packs a full-throttle thrust of close to a third of a ton, enough to lift a speedboat out of the water. At 34 m.p.h. the 13" prop of a light 200-hp. cruiser is turning about 4,000 r.p.m. Its 12" pitch is driving about 32,000 pounds of water a minute. Change that pitch by the width of your thumb and you gain or lose the push of more than a ton of water every

Prop styles vary to suit working conditions. These are a few of the styles you might use.

Prop for Your Boat

60 seconds. Many a race has been decided by less.

How a propeller works. Engineers see it not as a screw, but as a pump without a housing. It moves a boat forward by jetting water backward. Its pitch is the distance it would move ahead in one turn like a nut on a bolt, if there were no "slip." Slip is a tricky word. It sounds like power lost, but is really power used. It's the water shot backward to give the rocket-push forward.

Light hydroplanes skim along with little drag, getting all the thrust they need from less than 10-percent slip. But they need high-pitched props to grab the fast-moving water and fire it backward. Heavier runabouts must jet more water backward to move ahead, but don't need as much speed. So props with lower pitch and greater area do the job at 15- to 20-percent slip. Cruisers, with still more weight, call for a bigger blast of water and get it from about 30-percent slip.

How do you spot a mismatched prop? If your hull is clean and your motor tuned, but other boats in your class outperform

you, your prop is suspect No. 1. If original equipment on an outboard, it's a compromise to cover a range of possible uses. It's underpitched on a light, fast boat; overpitched on a slow, heavy boat. That's why many outboards are sold without props, leaving the choice to you. Added equipment, water absorption, or heavier passenger loads can also boost boat weight enough to call for a prop change.

Check up by comparing the pitch and diameter of yours with a propeller manufacturer's specs for your motor and general boat type. If your motor isn't listed, pick the nearest r.p.m. and hp. as a starting point. (Some props have diameter and pitch stamped on them; others carry a number that gives you the data from a dealer's list.)

The lists are extensive. Columbian Bronze Corp., for instance, lists nine pages of outboard and inboard-outboard props matched to boat types. But your specific make and design of boat and your own kind of boating are the variables.

To pick the right prop, keep car gearing in mind. High pitch, like high gear, is for

How to tell a right-hand prop from a left-hand one



Left-hand prop turns counterclockwise when viewed from astern (behind the boat). A memory aid: At the *top*, blade moves to *left*.

Right-hand prop turns clockwise when viewed from astern (behind the boat). A memory aid: At the *top*, blade moves to the *right*.



Viewed from the tip when resting on a table, blades of a *left-hand* prop point up to the *left*. (Turn the prop over, and it still does.)



On a *right-hand* prop, blades viewed from the tip point up toward the *right*. It's the same if you flip it over. Invert the page to prove it.

speed. Low pitch, like low gear, is for pulling power. Diameter is the rest of the picture, though you can seldom increase it because of limited clearance. Divide the pitch by the diameter to get the pitch ratio. (Example: 20" pitch with 10" diameter equals pitch ratio of 2.) The ratio is a handy guide when you have to vary from the dealer's-list prop; each class of boat works best with a prop in a specific pitch-ratio range. In general, the slower the boat and the heavier the load, the lower the ideal pitch ratio.

The propeller you need will lean toward the end of the scale that suits the job you want done. A tug needs a ratio of .6 to .8, as does a houseboat. A fast utility or cruiser calls for 1.0 or 1.2, and a typical racing run-about almost 1.7.

Power with skis. If your boat is fast when running light, but slows sharply when you tow a skier, switch to a slightly lower pitch. A decrease of 1" often does the trick on a high-speed motor. Slower ones need more change for the same effect. But you swap speed for pull (several m.p.h. on a 1" change), so don't overdo it. In the 15- to 18-hp. range, prop-matching is critical enough to make the difference between ski-towing or not. The reason: Mismatched props can waste more than a third of your total driving force.

If you want more speed instead of pulling power and your engine revs up to rated r.p.m. with some margin to spare, the chances are that higher pitch will bring higher speed—often six m.p.h. or more. Use the selector list if it fits your boat-motor combination. If not, an inch pitch boost is a safe try. If your engine can't presently reach or exceed rated r.p.m., however, your prop may be overpitched. On a planing hull (and some displacement hulls) you may actually gain speed with a lower

pitch that lets your engine hit full power.

But the story may reverse on a heavy boat with a high-speed engine and no reduction gearing. It frequently happens when an older cruiser is repowered with a home-cooked auto conversion. And it's likely on an auxiliary sailboat using a small high-r.p.m. motor and direct drive. A prop small enough to let either engine reach rated r.p.m. is likely to be too small to give a decent push.

The answer is a larger-diameter prop that gets a better bite even though it holds r.p.m. down as much as 35 percent (as it does on some sailers). The added blade area gives more push from less power.

Variations in these special problems are almost limitless. But there's plenty of help. Most prop manufacturers offer free advice. Many dealers keep assorted tryout props on hand so you can judge which to buy from a test run. Others use controllable-pitch propellers that can be adjusted to serve the same purpose.

How many blades? The fewer the better. Fewer entering edges; less turning resistance. In practice, three blades lead. They provide the needed area in diameters small enough for usual clearance.

Two blades are the choice for racing. They're also best on auxiliary sailers as they can be stopped in a vertical position for minimum drag under sail. You won't see two-bladers in large sizes because the blades would need impractical thickness for strength. (The thinner a blade, the greater its efficiency.)

Four blades wring out the last drop of thrust where clearance is limited and the load heavy. In the borderline power range, the extra blade often adds the final nudge needed for ski-towing.

Five blades have a different purpose: quietness. Vibration is less with odd-num-



Final grinding and finishing operations on a new prop are done by hand. Completed prop will be balanced on a machine that, in a larger version, can detect imbalance of one ounce, nine feet from the center of a 35,000-pound ship prop.

bered blades than with even numbers (submarines used the idea first). But five-bladers are limited to large cruiser and yacht types. You wouldn't sense the difference in smaller sizes.

Bronze or aluminum? Original outboard equipment is usually die-cast aluminum alloy. It's strong and light, but brittle. Hit something really hard and it doesn't bend. It breaks. In a custom-made prop you get cast manganese bronze or cast aluminum alloy. The aluminum is lighter and costs less (\$16.50 versus \$23.50 in a typical 10" model).

Both types bend on impact instead of breaking. But aluminum isn't as tough and can't be repaired as often. If you want an almost unbreakable prop for shoal waters, there's Superston bronze, a British-developed alloy so rugged Columbian guarantees it against blade breakage for 10 years. A 10" prop in Superston costs \$40.65.

Cavitation need not bother you if you follow the rules. It occurs when a prop has too little area for the power and creates so much suction ahead of the blades that

the water expands to vapor. This pits the blade and cuts efficiency. The "anticavitation plate" on outboards and I/Os isn't really concerned with true cavitation, but with air that might be sucked into the prop disk.

Avoiding and repairing damage. Tests by Volvo show that if you can't avoid an obstacle, you're better off hitting it dead on, not swerving. Then the motor's skeg protects the prop. Also, your underwater gear is designed to take forward, not sideward, impact.

If you do bang up a custom prop, repairs aren't too high. Columbian Bronze, for example, reconditions a 10"-diameter wreck at a fixed price of \$5.90 if no welding is involved.

If you've changed props, it pays to keep the old one aboard for a spare. It's better to limp to port with a mismatched prop than a smashed one. If your extra prop is cast bronze or aluminum, you can probably make it a good match by having the pitch changed (as much as 4") for about half the price of reconditioning. ■ ■

Propeller Trouble-Shooting Chart

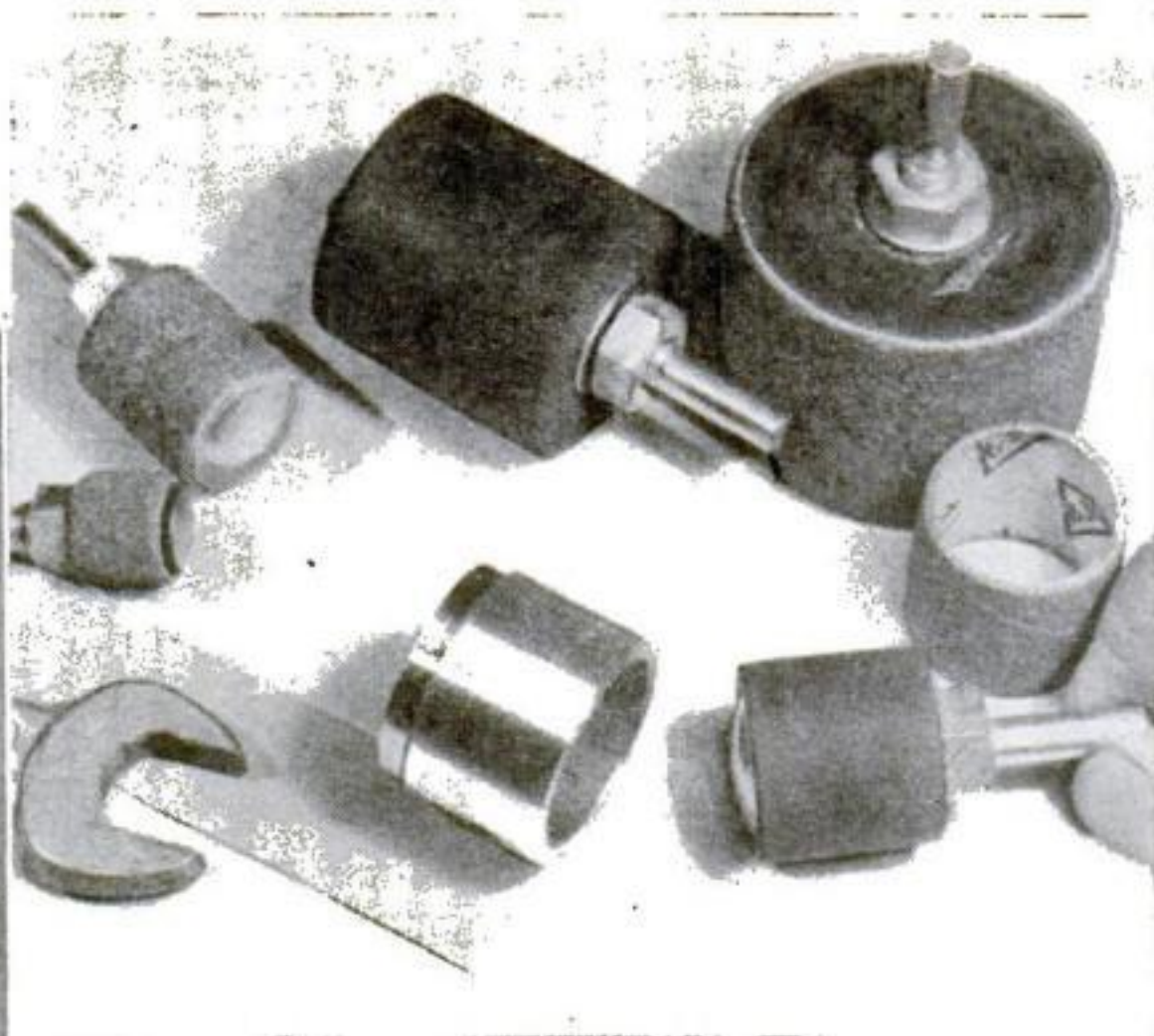
SYMPTOM	PROBABLE CAUSE	CURE
Normal r.p.m., speed and power poor	Prop too small	Increase diameter
R.p.m. stays low, poor pulling-power, speed under par	Pitch too high	Decrease pitch
R.p.m. normal, speed okay, pulling-power poor	Prop pitched for speed	Decrease pitch slightly for pull
R.p.m. tends to race, pulling-power fair, speed poor	Pitch too low	Increase pitch
R.p.m. normal, high vibration, speed and power under par	Bent prop or broken blade	Repair or replace
Performance okay, prop makes singing sound	Prop picking up subsurface vibration	Have trailing edges factory-ground to chisel bevel

Record pitch and diameter of a prop that works well so you can replace it if lost.

When switching to a smaller prop to clear a shoal bottom, don't reduce diameter more

than 15 percent. Pitch must be greater, of course, to maintain load on engine.

Add 1" to recommended prop diameter if it is to work close to heavy deadwood.



Sanding drum holds work for polishing

Sanding drums with compressible rubber cores will hold tubular pieces securely in a drill chuck or lathe for filing and polishing. To make the setup, I simply remove the sanding sleeve and mount the workpiece in its place. If the rubber drum is too

small, I use strips of heavy paper or cardboard as bushing material.

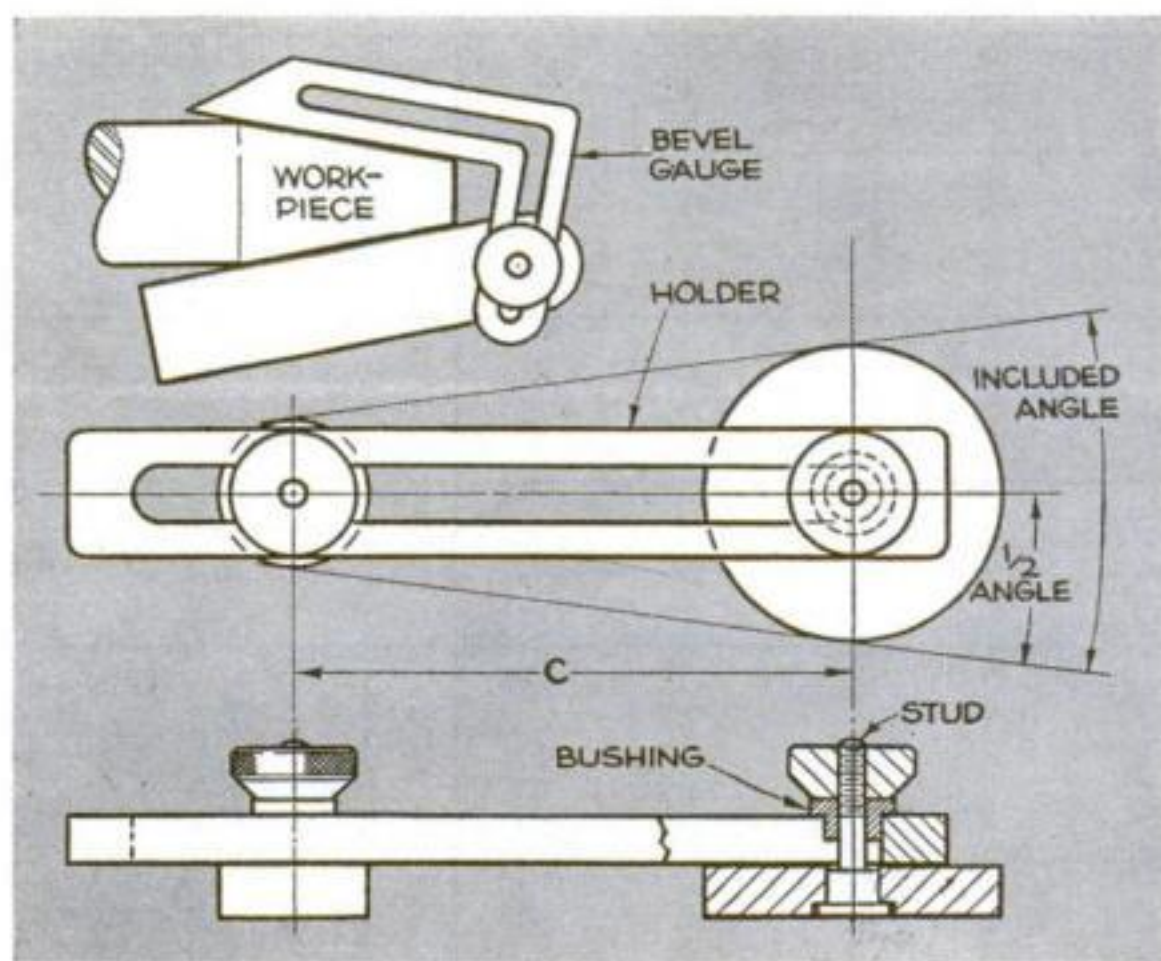
A set of sanding drums like those above will handle a wide range of diameters. Just be sure a workpiece is securely held by the drum before setting it into motion. If wobbly, loosen the compression nut and readjust.—Walter E. Burton, Akron, Ohio.

Homemade gauge checks tapers accurately

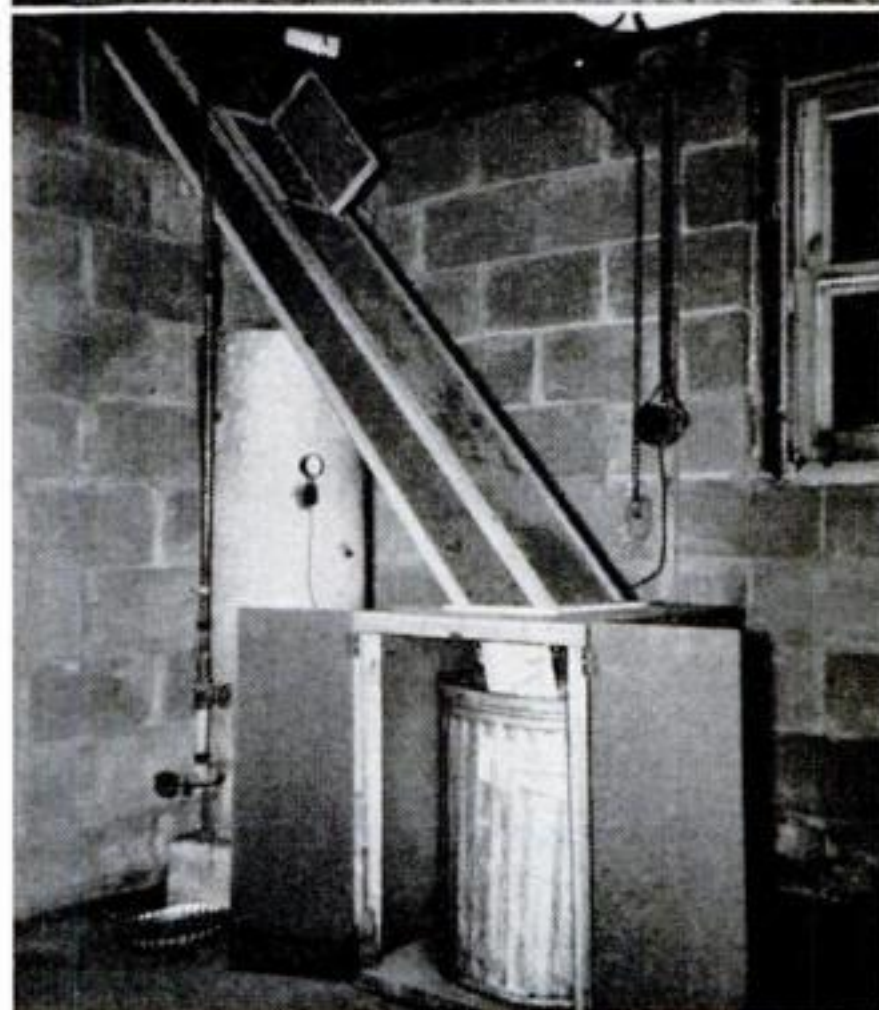
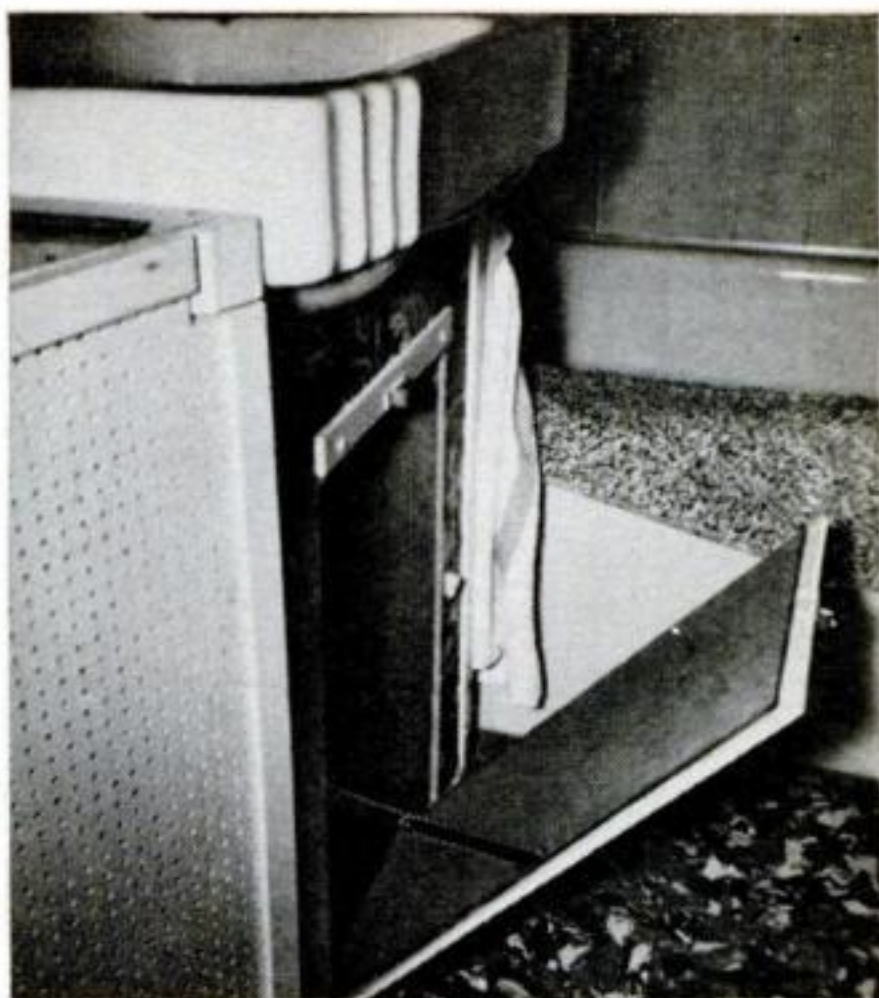
With this gauge, which you can make on your lathe, you can measure female tapers directly, or male tapers by setting a universal bevel gauge as shown. The gauge is used in conjunction with a micrometer and simple math to give a precision measurement.

The size and number of disks will depend on the range you want to cover. However, three disks—.680", .760", and 1.400"—will measure included angles of $1\frac{1}{2}$ degrees to $38\frac{1}{2}$ degrees when used in a holder having a slot $3\frac{1}{2}$ " long.

To use the gauge, move the disks along the slot in the holder until both are in contact with the sides of the taper. Tighten the knurled thumbscrew and measure across the disks with a micrometer. Subtract half



the diameter of each disk from this measurement to get distance C. The difference in disk diameters divided by twice C gives the sine of $\frac{1}{2}$ the angle. Look it up in a table of trigonometric functions to find the angle.—M. W. Loftus, Chicago.



Garbage chute has a clean-out door near the basement ceiling in case anything gets stuck.

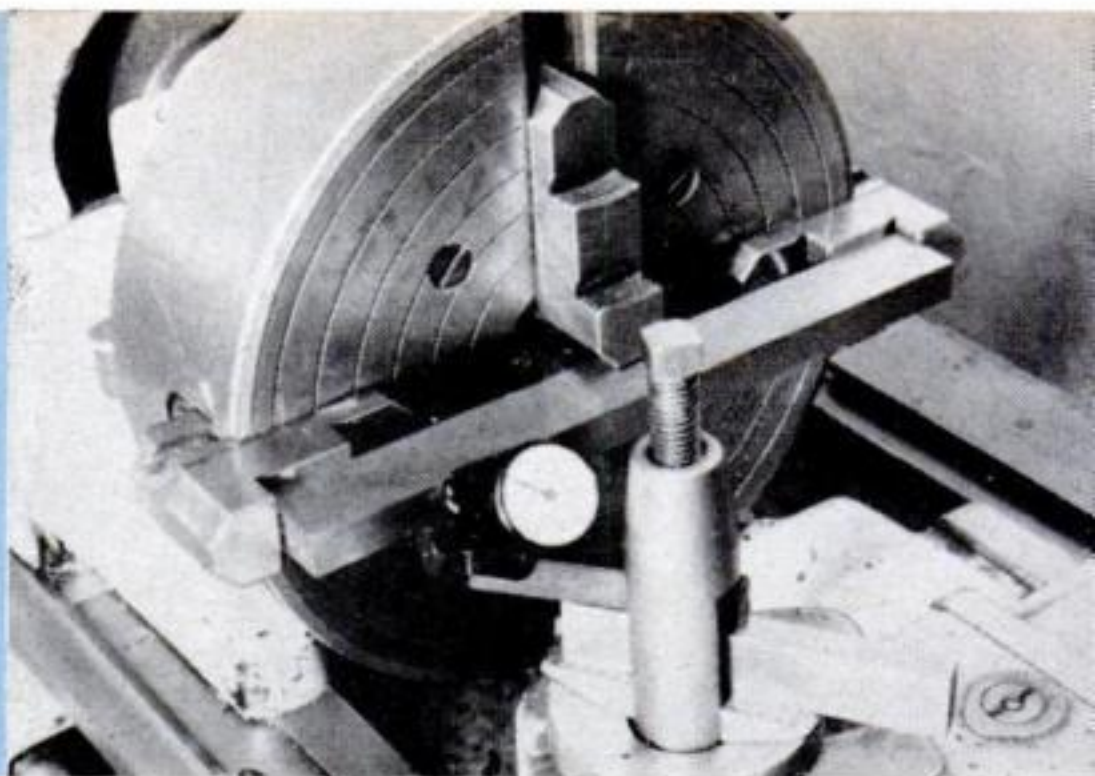
Laundry chute ends at bin with sturdy hinged door that drops down, held by furnace chain.

Chute the Works! -and save steps

OUR house has two chutes that I installed to deliver garbage and laundry to containers in the basement. Both of the chutes are built of one-by-twos and hardboard. Dirty clothes and bagged garbage slide easily down the polished surface of the hardboard.

The laundry chute leads from an opening under the bathroom sink to a large box on the basement wall. The garbage chute is placed between two-by-fours in the kitchen wall. In the basement, this chute slants downward to an enclosure for the garbage can, placed under the chute with the lid off. Doors hide the can.—*Michael Martinick, Jackson, N. J.*

One MACHINIST Tells Another...



...how to check a lathe cross slide

WILL your lathe face off a perfectly flat surface on work held in the chuck? Here's an easy test setup that will give you a precise answer.

First, tighten the thrust-adjustment nut at the rear of the spindle so that the spindle is drawn snugly into its axial thrust bearing. Be sure the four-jaw chuck is seated tightly against the shoulder on the spindle. Chuck an accurate, hardened-steel parallel between opposite jaws. Test alignment of the parallel by rotating the chuck by hand and checking each end with an indicator on the tool post. If it does not register exactly the same reading at each end, adjust the parallel in the chuck until it does.

Now position the chuck so the parallel is horizontal. Lock the lathe carriage to the bed. Set the indicator in contact with the parallel and traverse the cross slide all the way across. If the cross slide is accurate, the indicator will show no variation from end to end.

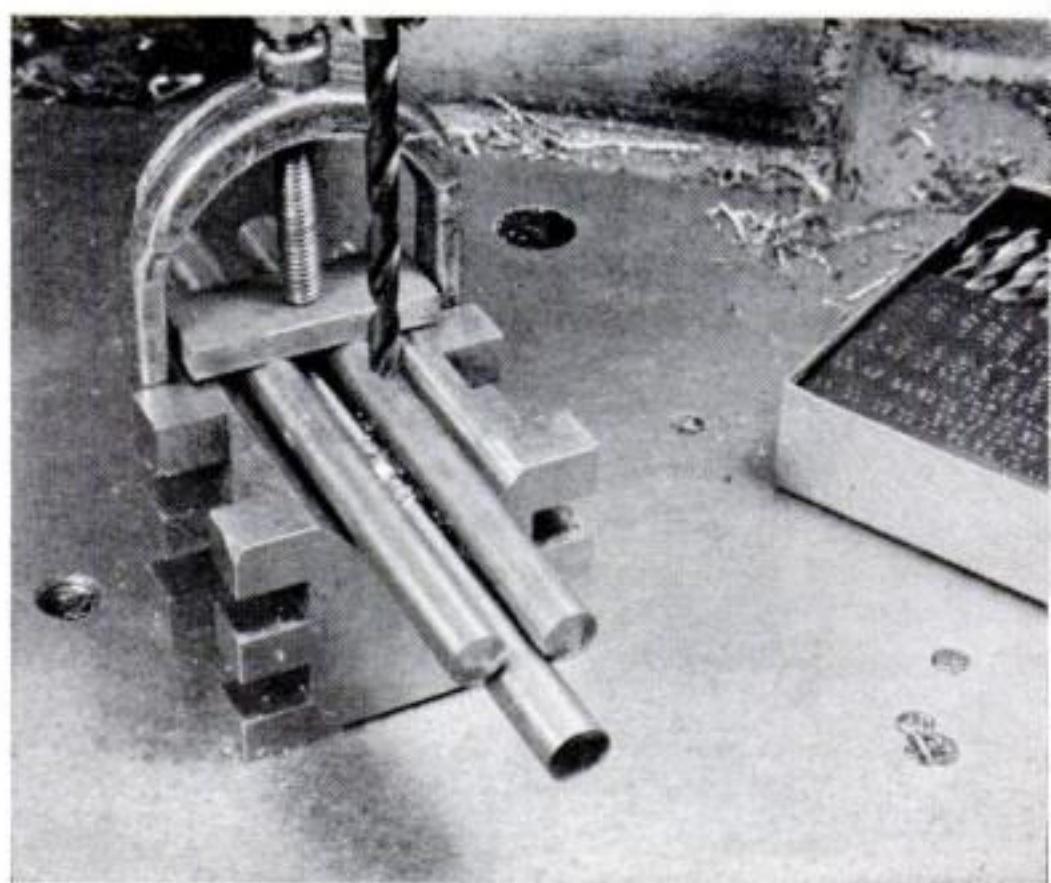
I have corrected several small lathes on which I found errors of a few thousandths by hand-scraping the cross slide. In one case the error was caused by damage to the lathe bed, which was keeping the carriage from seating properly. When these scars were removed, the cross slide checked true.

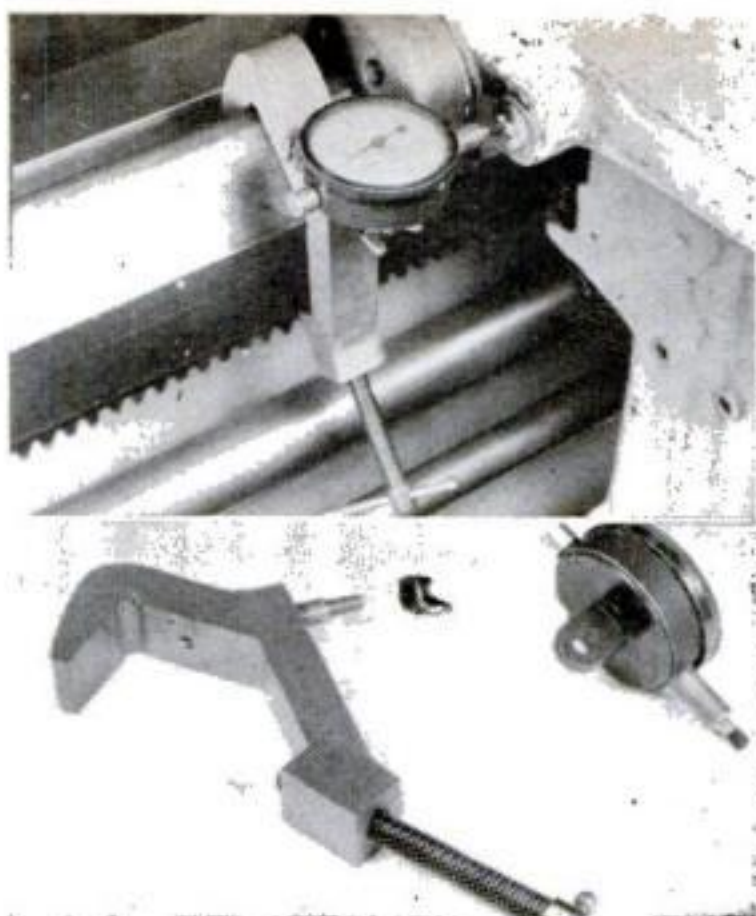
By H. J. Gerber

... quick jig setup centers hole for cross-drilling

You can quickly set up a self-centering jig to cross-drill round stock by using an ordinary V block, clamp, and two pieces of drill rod. The drill rod can be any size that's handy as long as the two pieces are the same diameter and smaller than the diameter of the work.

Clamp the work and rods in the V block, using flat stock under the clamp screw. Select a drill size that will just fit between the two rods straddling the work. Guide the drill between them and spot-drill an indentation in the work. Switch to the drill of the desired size and drill through, using this indentation as a center mark.

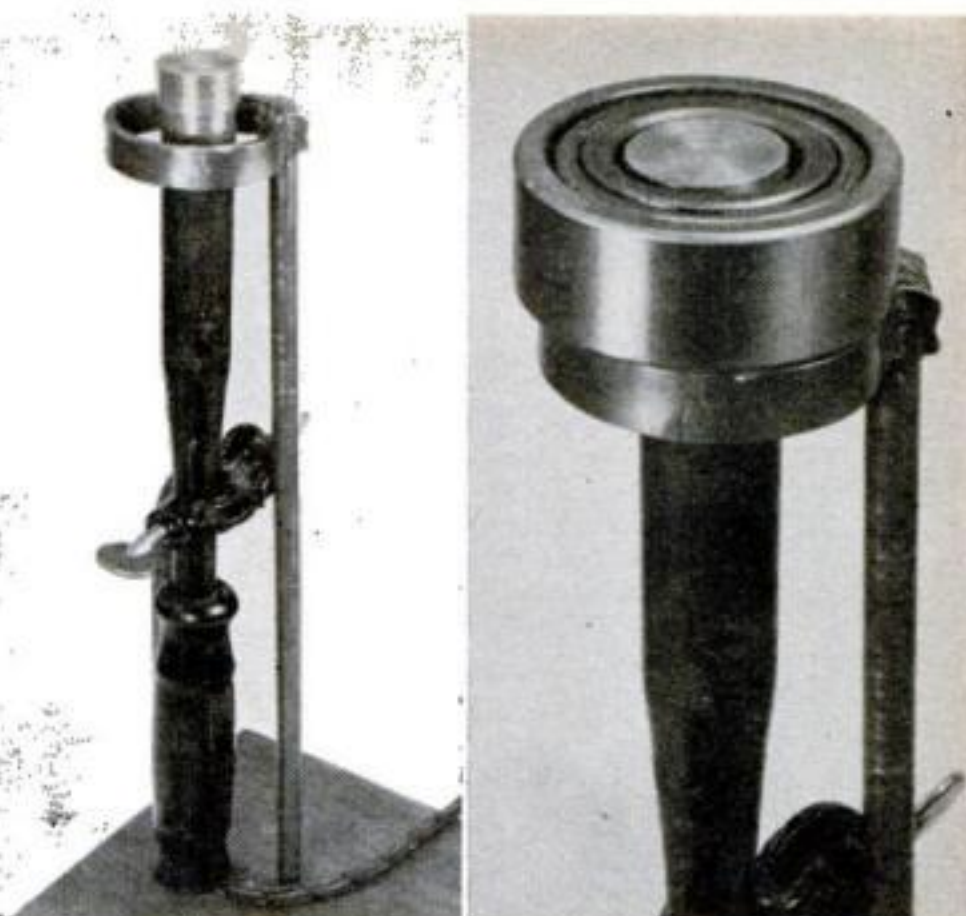




... dial indicator makes a precision carriage stop

When machining to shoulders, you can repeat to within a thousandth of an inch if you use your dial indicator as a carriage stop. I made up a quick-release clamp to hold the indicator. It hooks over the front way of the lathe bed and locks in place, with one screw seated on the underside of the way. I bandsawed the one shown from flat bar stock.

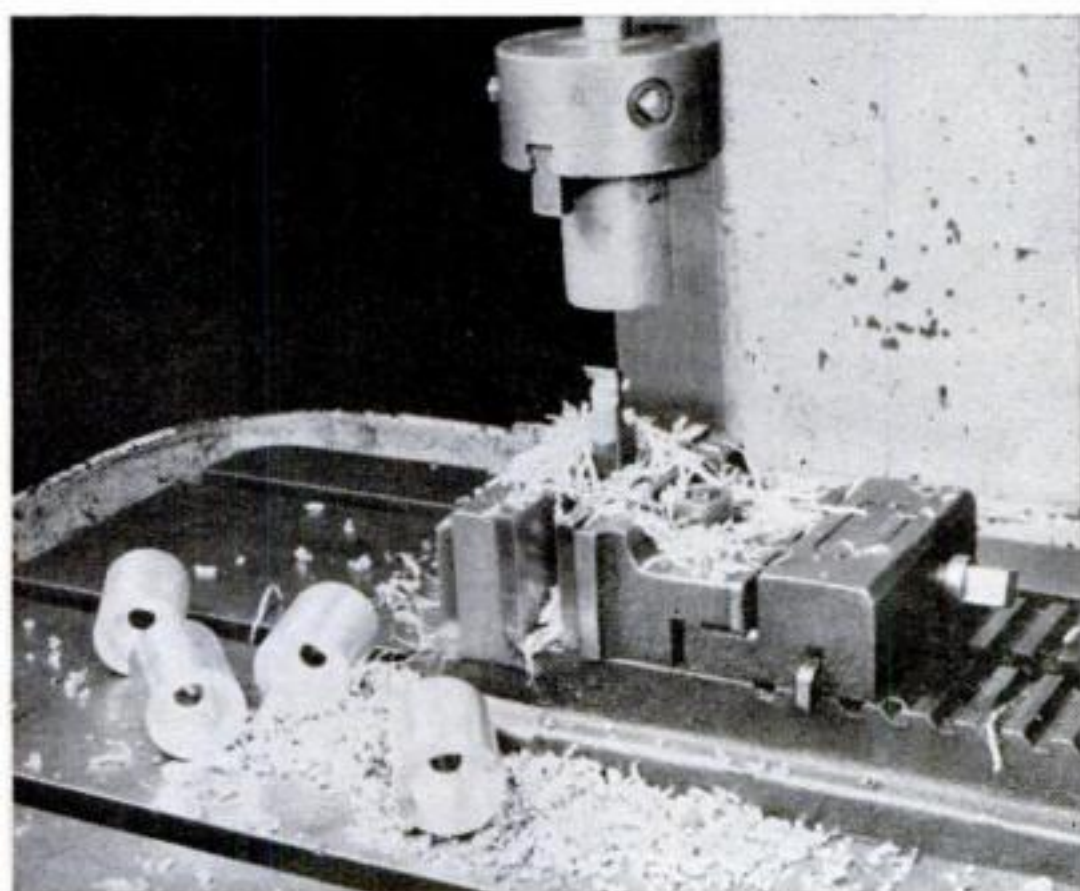
When you mount the indicator, position it so the contact button will seat against the stop pad on the lathe carriage.



... soldering-iron heater simplifies bearing installation

Before fitting the ball bearings to a shaft, the inner race should be heated to about 212 degrees F. to expand it slightly. This permits the bearing to slip on without forcing and avoids installation damage.

I made my own special bearing heater from an electric soldering iron. I removed the copper tip and replaced it with an aluminum plug with a slightly smaller i.d. than that of the race. I turned up a complete set of plugs to fit common bearing sizes. A homemade ring stand holds the soldering iron upright and supports the bearing being heated. The temperature is right when a drop of water on the inner race sizzles.

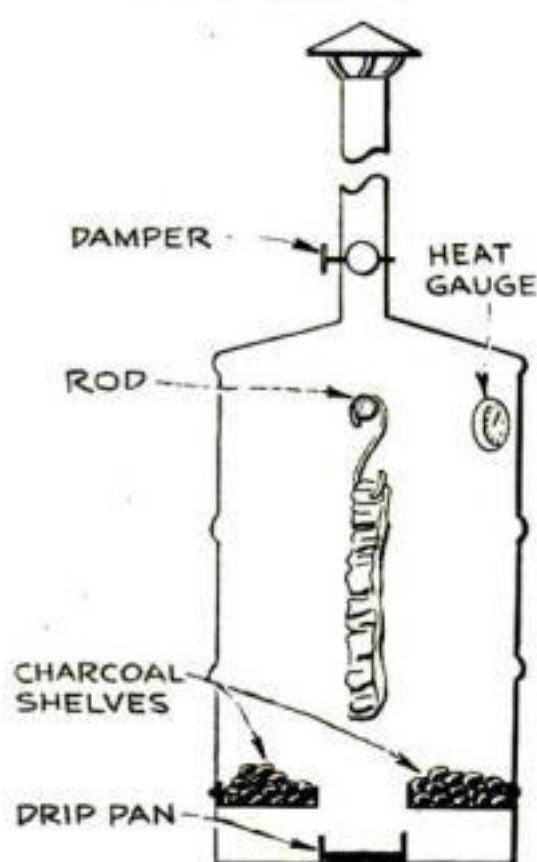


... how to do precision boring on a drill press

Although unorthodox, this setup produced work to the required accuracy and with a very fine surface finish.

I had a number of aluminum sleeves to bore and face, and there was no lathe available. I tooled up the job on a drill press, using a small universal chuck on the drill-press spindle to hold the work, as you see in the photo. The combination boring and facing tool was held in a vise bolted to the machine table. Work was fed down to the tool by the spindle feed.

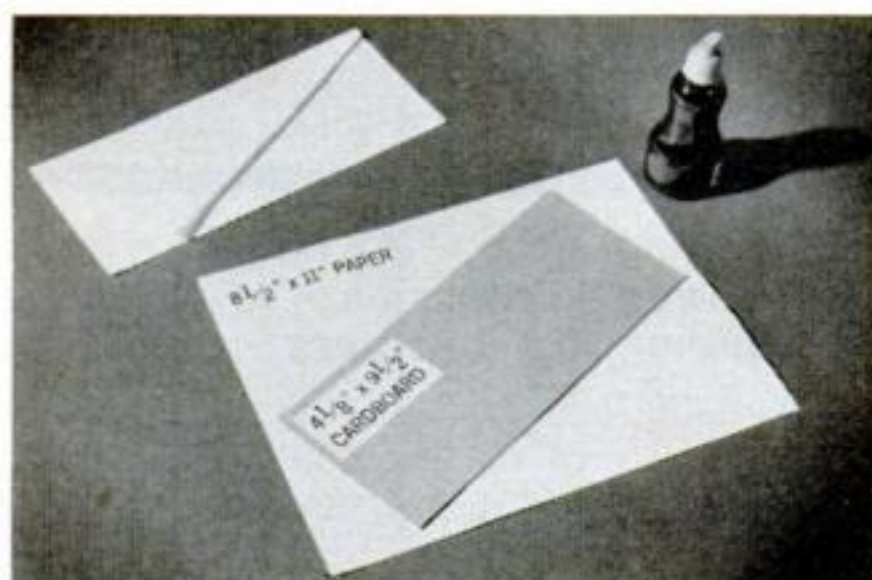
The job took no longer than it would have on a lathe. A bonus was the freedom from chip interference—chips dropped out of the work as fast as produced.



Charcoal smoker from a steel drum

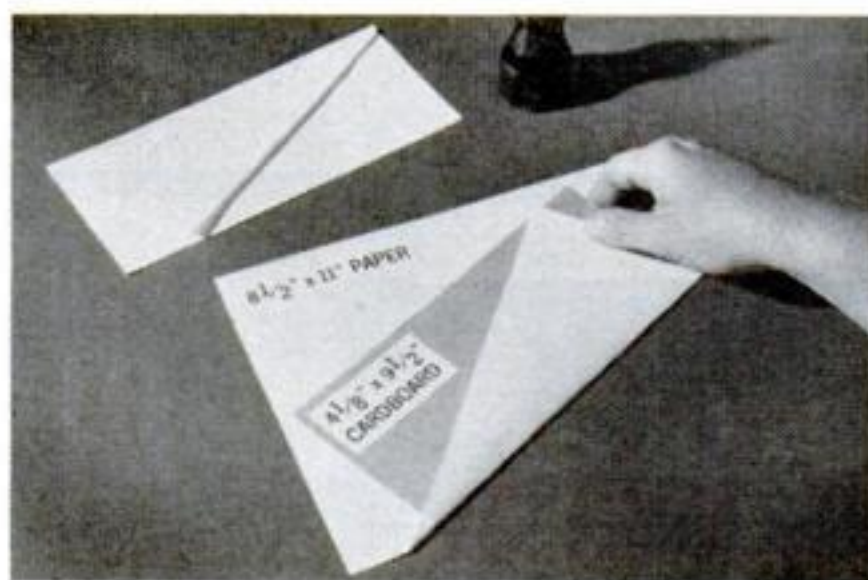
Like many barbecuers, Dr. Murray Wardall of Kansas City, Kan., feels that spare-ribs are tastiest when cooked with smoke. He made his cooker from a 50-gallon drum by bolting two charcoal pans 3" from the

bottom and drilling vent holes near them. A metal rod supports the hook-hung ribs. The lift-off conical lid has a stack with a damper. When the charcoal is going well, Dr. Wardall tosses on water-soaked hickory limbs and keeps the temperature over 225 degrees while the ribs cook (about 2½ hours).

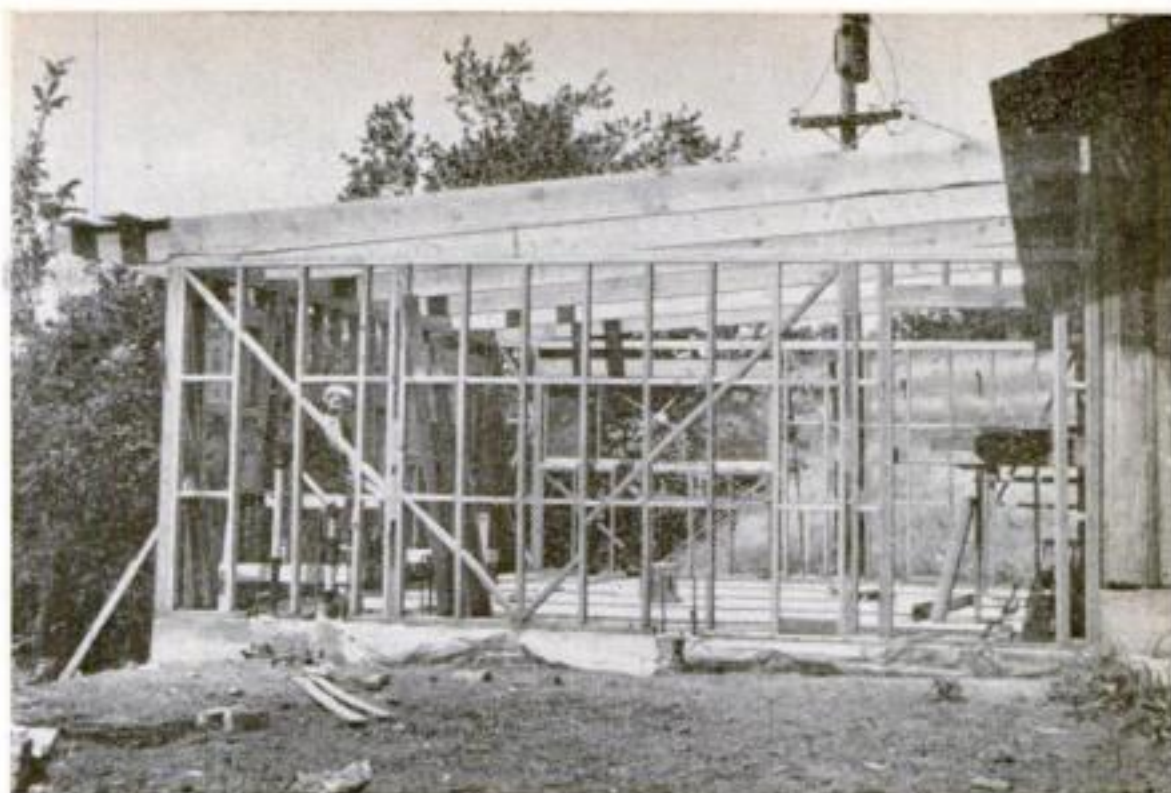


Emergency envelope needs no cutting

Ever have to mail a rush letter and find you had no envelopes? If you keep a cardboard the size of a No. 10 (business) envelope handy, you'll always be able to make one in a jiffy from a sheet of typing paper. Center the cardboard at an angle (above) and fold up the bottom corner (upper right). Fold and paste the side tabs (bottom right), remove the cardboard, insert your letter, and seal.—*Frank Shore, NYC.*



Pointers on Good Framing



Putting up a house or addition?
Nothing is more important than
the skeleton on which you build

By R. J. DeCristoforo

THE house frame is the skeleton over which inside and outside coverings are applied. Besides providing the basic strength of the structure, the framing is designed to make all subsequent construction as easy as possible. For example: A single stud at corners would be strong enough, but an *assembly* of studs is used to provide nailing surfaces for finishing materials.

Thus the framing sets the pace for the entire house—yet it's the easiest and fastest

part of home construction, and one that an amateur carpenter can do himself.

The secret of a good framing job is a sound—and consistent—nailing schedule, such as the one offered below. It tells you what size common nails to buy, and how many you need for each joint. Using more than the recommended number won't help—and it may hurt. Splits and cracks, caused by excessive nailing, may not develop until after the framing is covered, when it's too late to spot them. Using fewer nails is as bad, of course. Examination of house-frame failures after severe storms reveals that frames don't break—they separate at joints, usually because of inadequate nailing.

A framing hammer is a good investment. It has a longer handle than a conventional hammer, and a corrugated face instead of a smooth one. You'll be working with heavy

CONTINUED

NAILING SCHEDULE

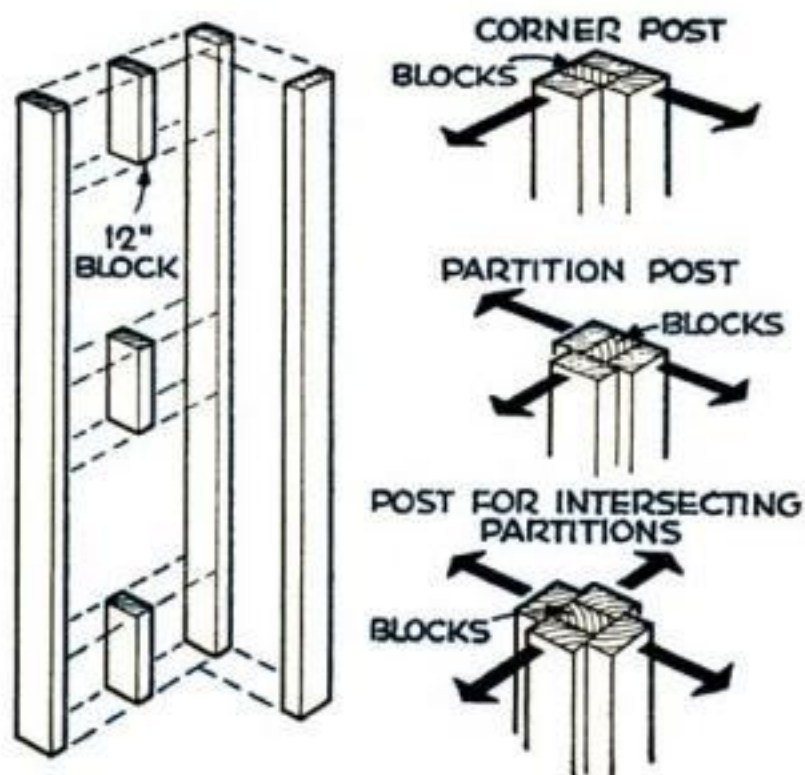
SUB-FLOOR	Two 8d nails for 6" boards (three for wider boards) at each crossing of frame members. For plywood, 8d nails spaced 6" along edges and 12" along intermediate members	STUDS	Four 8d nails: two on each wide face toenailed to soleplate	HEADERS	Four 10d nails through studs into headers (more for wider or full headers)
		DOUBLED TOP PLATE	Bottom member to each stud and post with two 16d nails; top member to bottom with 10d nails—two at ends and spaced 16" between	SILLS	Lower member directly into each stud beneath it with two 10d nails; upper member to lower with 10d nails spaced 8". Two 10d nails through studs into each end of sill
SOLE-PLATE	When nailed to header's through subfloor, 16d nails staggered and spaced about 16"	LET-IN BRACING	10d nails—two at stud crossings, three at ends	FIRE STOPS	Two 8d nails when toenailing, two 10d nails when end-nailing
BLOCKED POSTS	Fasten first stud to each block with single 10d nail—then other studs to each block with three 10d nails	FILLERS TO STUDS	10d nails staggered and spaced about 16"		

NOTE: Nails recommended are minimum sizes for standard framing lumber (2" nominal thickness). Next-larger-size nail may be used in each case so long as it doesn't cause splitting



Spacer block on soleplate serves as brace for toenailing. It's cut to length of 16" minus thickness of one stud. Assembly of posts (right) depends on number of walls each post joins.

You start with the verticals



nails, so the longer handle permits a heftier swing; and the corrugated face virtually eliminates slipping off the nailhead.

Start with the post assembly. Don't be careless—uneven assemblies may not affect the strength of the structure, but may pose problems later when you apply inside and outside covers.

Our tips and illustrations assume you'll be doing a vertical assembly—that is, that you'll erect a completed frame as you go along, not build flat sections on the ground to be raised in place later. Vertical assembly is almost a must if you are working alone. The horizontal, tilt-up method takes more muscle than one man has.

Set corner posts first, toenailing at the

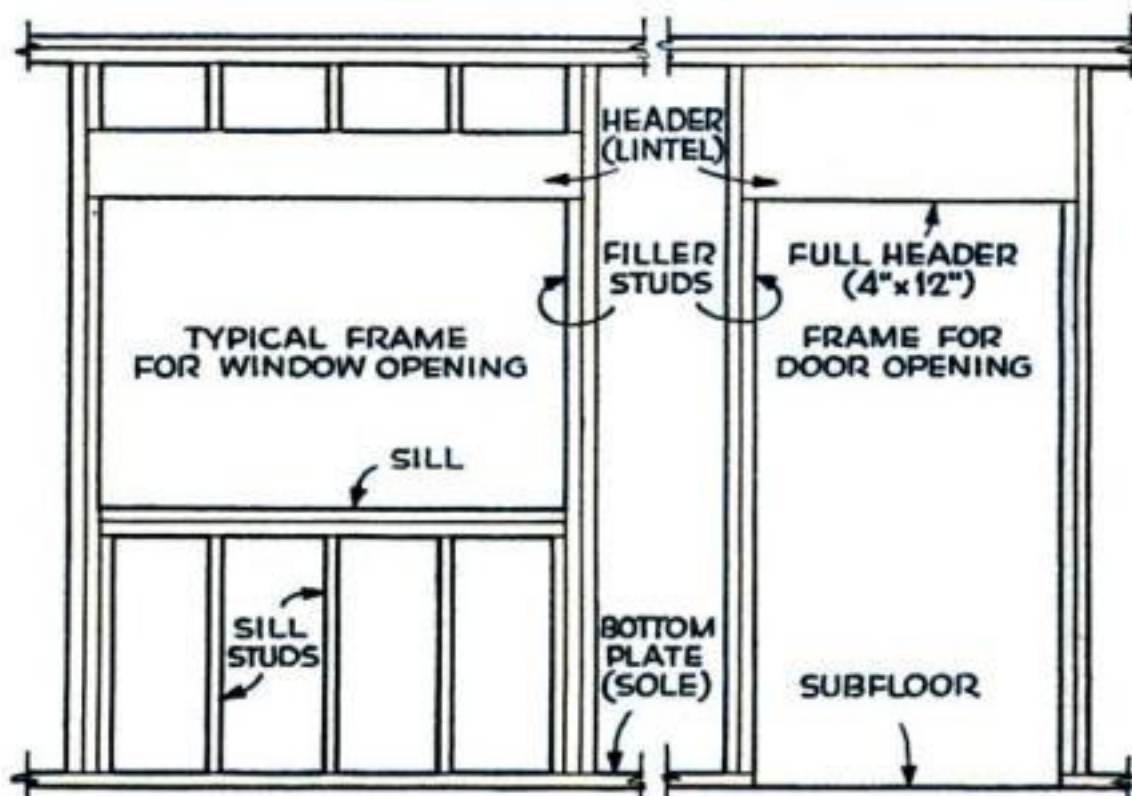
base and using temporary braces and a carpenter's level on two adjacent faces to be sure they're absolutely plumb. Next, install any partition posts in a similar fashion. Again, see that all posts are perfectly vertical to save headaches later. And don't skimp on the temporary bracing.

Place the bottom member of the doubled top plate across the posts—but don't nail it. If the span is great enough for this piece to sag, set up a temporary stud at the center for additional support. Mark locations for windows and doors, and erect the outlining studs for these openings. Toenail at the bottom and nail through the plate into the top end.

Follow the same procedure with adjacent

Framing of openings must be accurate

Keep openings square so windows, doors, and trim will be easy to install. Door header may be framed like window at far left, or solid plank may be set in on top of the filler studs (right). Time saved may make up for extra lumber cost.



Exposed-beam and roof-deck construction can be a one-man job



Shed-type roof with 20' span needs four-by-twelve beams. Header on wall was nailed through to studs of original structure. Beams were dropped in metal brackets on header.

Lifting or shifting heavy beams for correct placement is easier with a homemade Y brace. Nail short boards to edges of stock that's as wide as beams are thick.

For tongue-and-groove joints, force roof boards together with a pivoting pry, tack-nailed to side of beam and moved as work progresses. Beam has notch where it meets top plate.

walls, and when all posts and window- and door-frame studs are in, nail the top plate member to the posts.

Now it's a question of filling in with studs. Using the spacer block shown in a photo, toenail two or three studs at the bottom; then shift to the top, nailing down through the top plate. Work from each corner toward partition posts and openings.

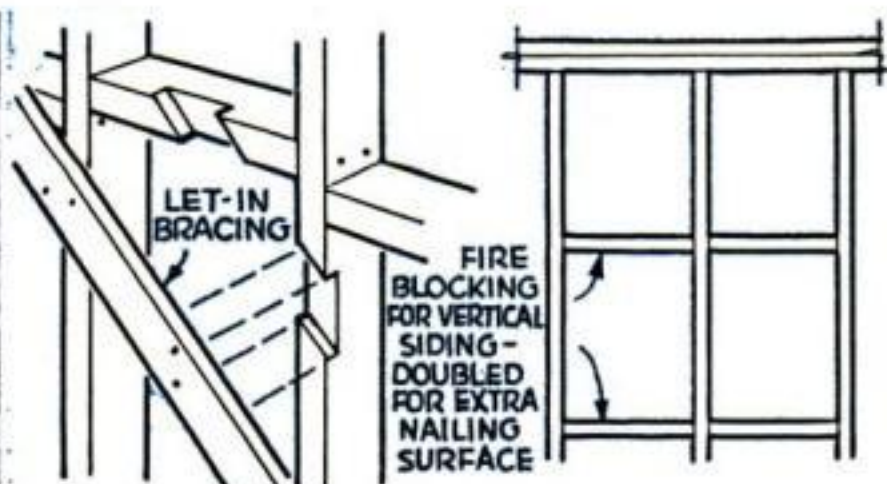
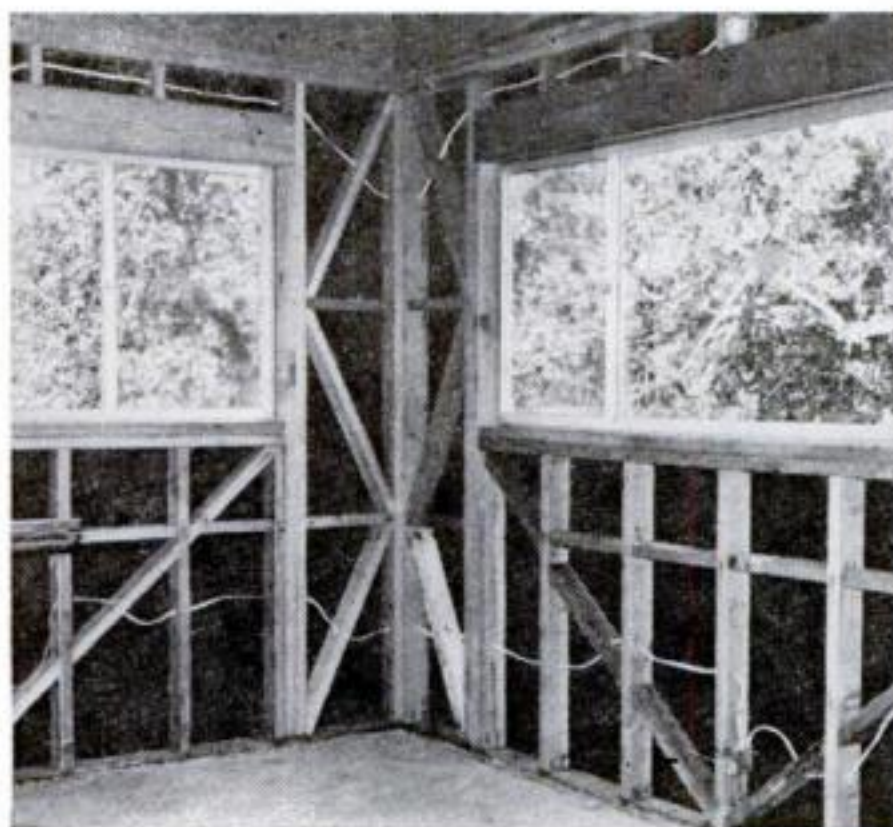
Framing the openings. Install the filler studs at each side of window and door openings, and set the headers in on top of them. Header size depends on the span. Your building inspector will tell you what the code in your area requires.

Cut sill studs for windows, and install first the bottom member, then the top one.

Use your level and square frequently. When all vertical members are up, nail on the top members of the upper plate. Then add braces and blocking as shown in the sketch. Braces are set at a 45-degree angle from the corners. Bracing can sometimes be eliminated when the structure is diagonally sheathed, or where big sheets of plywood are used as siding.

Roof framing is a little more difficult because rafter ends must be cut at an angle. A hip roof requires some compound angle cuts. Instead of trying to arrive at these mathematically, your best bet is to use a scrap piece of two-by-four and some trial-and-error cuts to arrive at the correct shape; then duplicate it on all the rafters. ■ ■

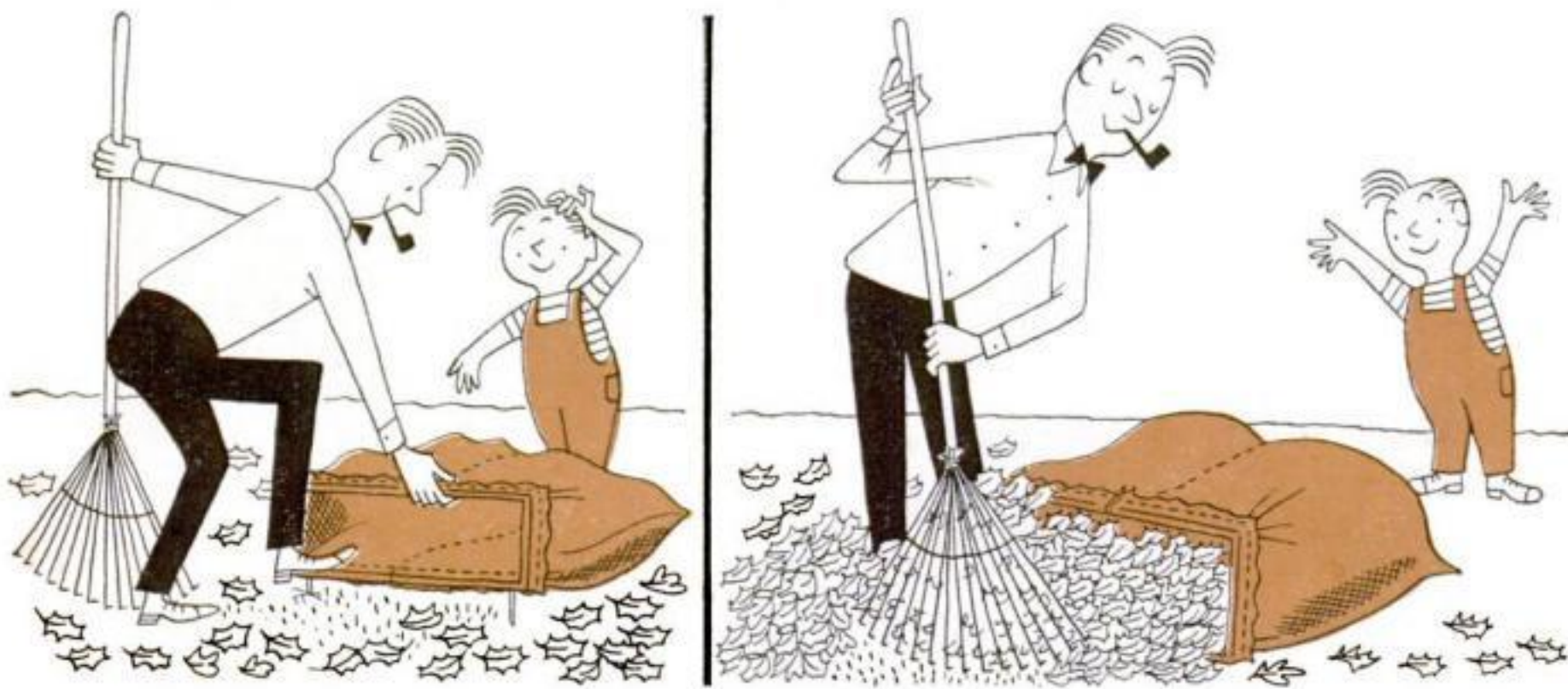
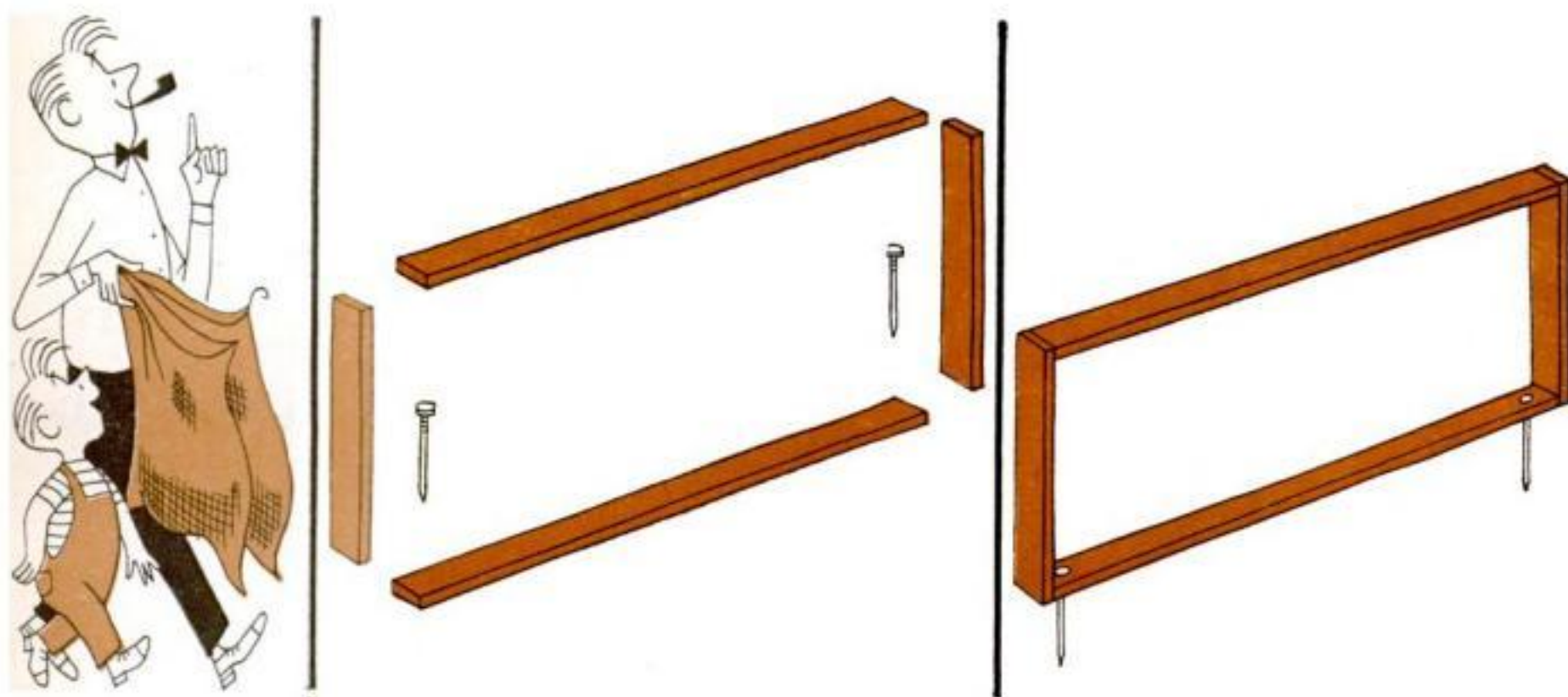
Blocking and cross-bracing complete the skeleton



Alternate methods of applying bracing and blocking are shown at left and above. Inside bracing in photo is good way to use odd lengths of two-by-four. Let-in bracing, first sketch, is stronger if it fits snugly in stud notches. Blocking pieces are cut to same length whether toenailed in straight line (photo and second sketch) or staggered for end nailing (center).

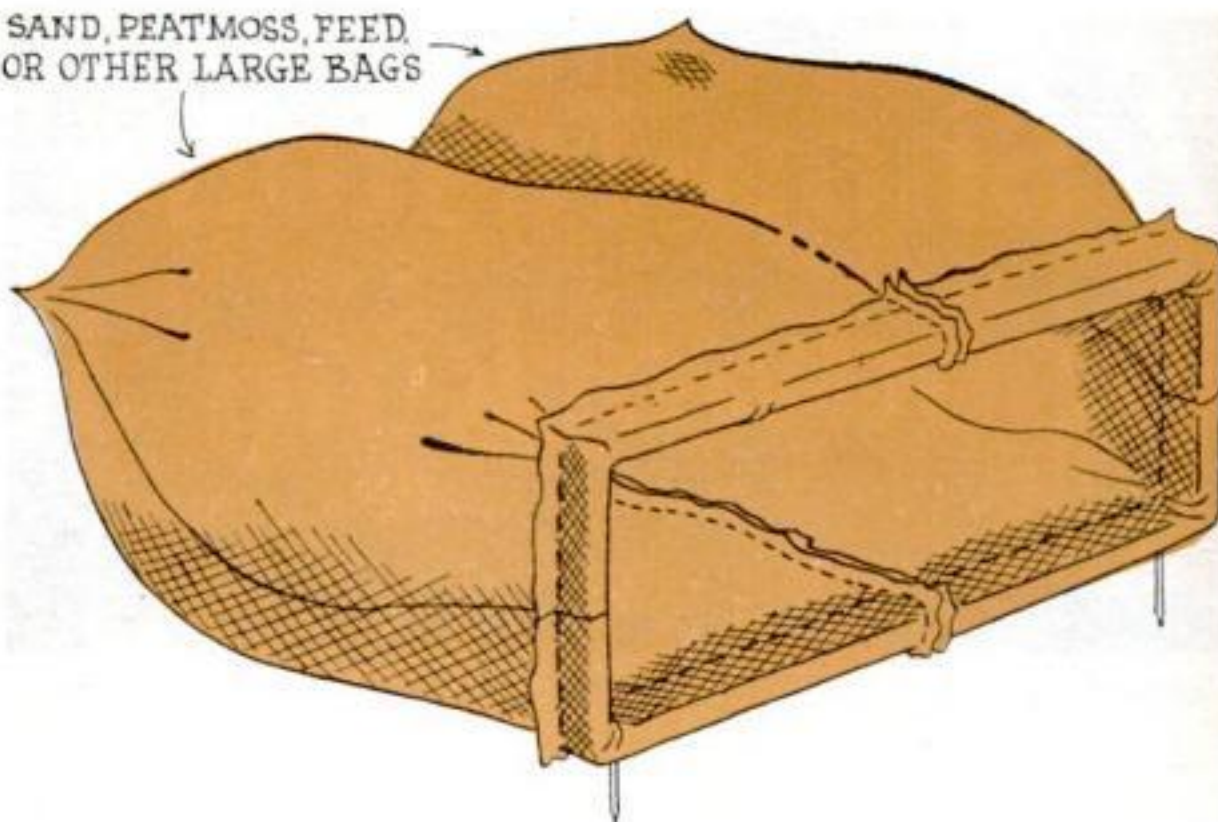
Wordless Workshop

By Roy Doty
and Arthur R. Tanner



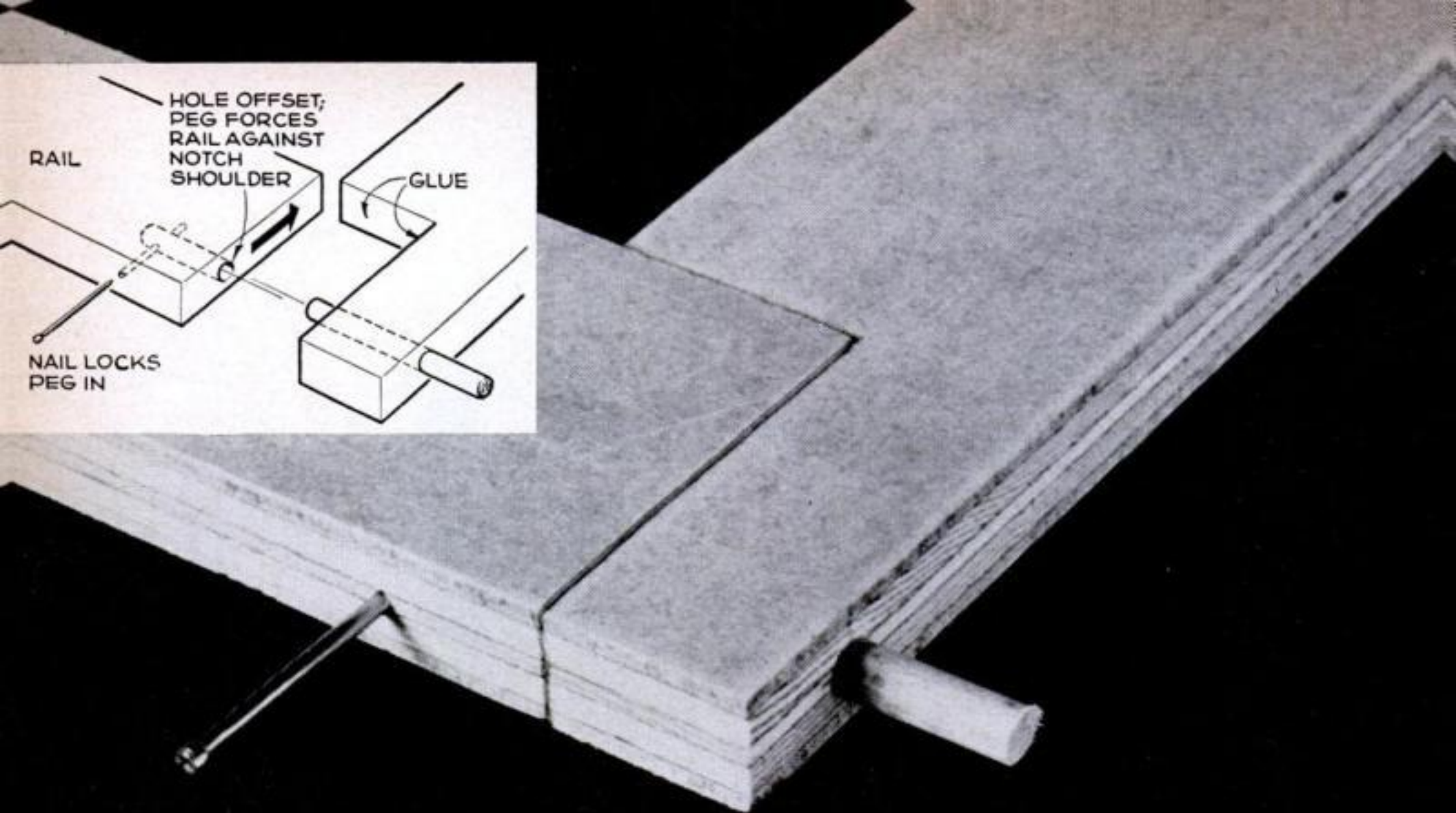
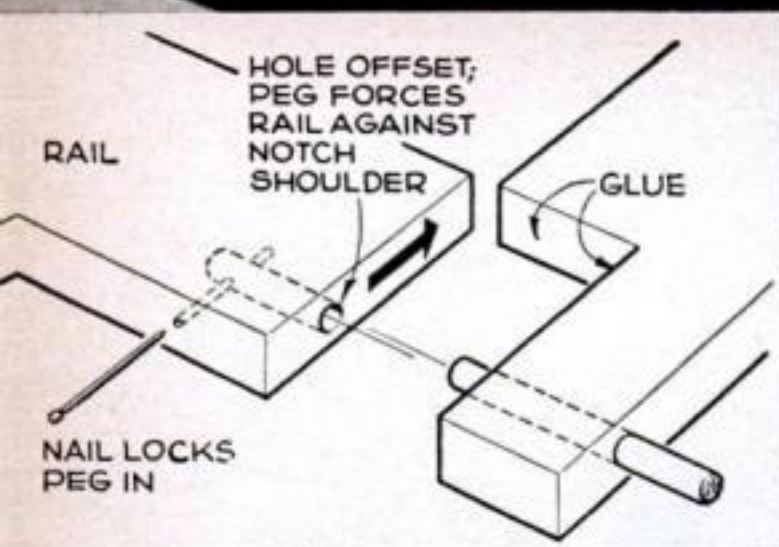


SAND, PEATMOSS, FEED,
OR OTHER LARGE BAGS



Got an idea for Wordless Workshop?

POPULAR SCIENCE will pay \$25 for each suggestion accepted for publication in this feature. Only rough sketches and a brief description are needed. Address: Shop Editor, POPULAR SCIENCE, 355 Lexington Ave., New York 17, N. Y. Contributions cannot be acknowledged or returned.



7 Shop-Tested Woodworking Joints

By R. J. DeCristoforo

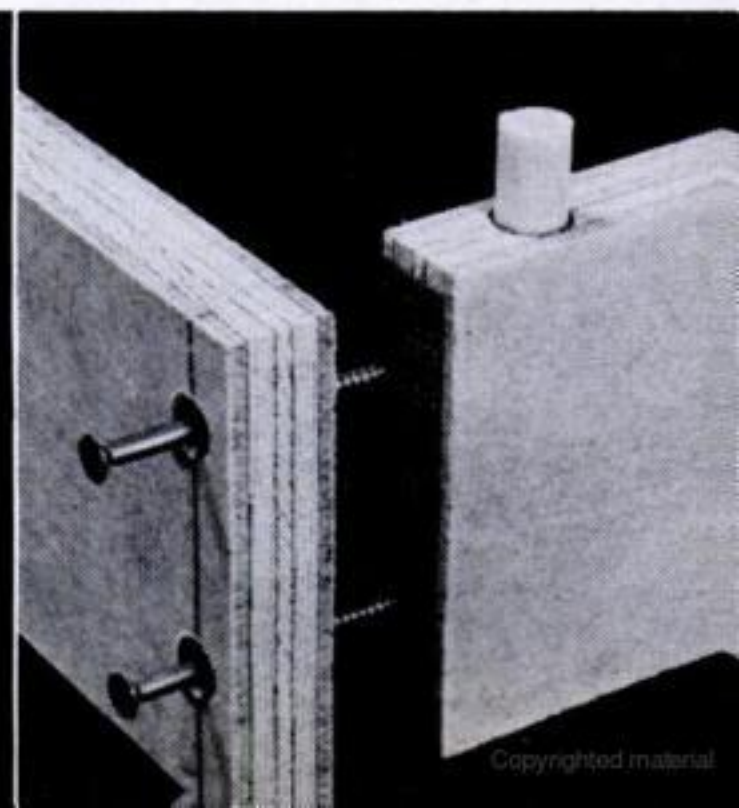
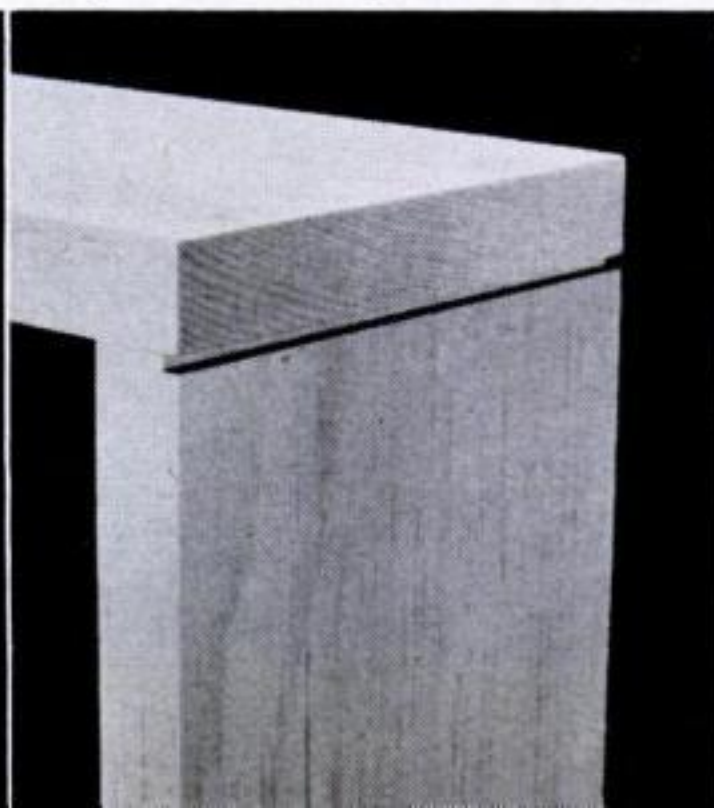
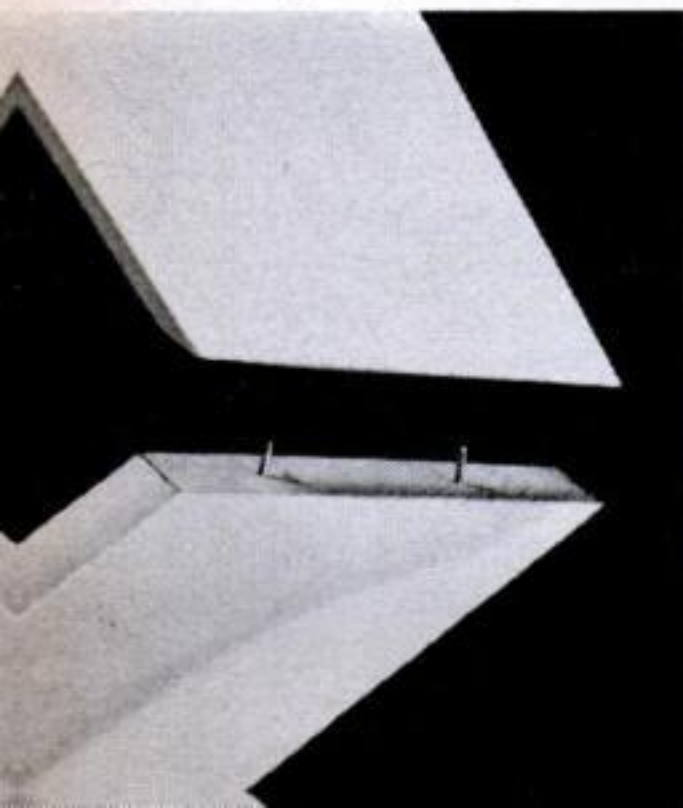
Notched and pegged corner joint provides larger gluing surface than an ordinary butt joint. The dowel hole in the rail is offset. Driving

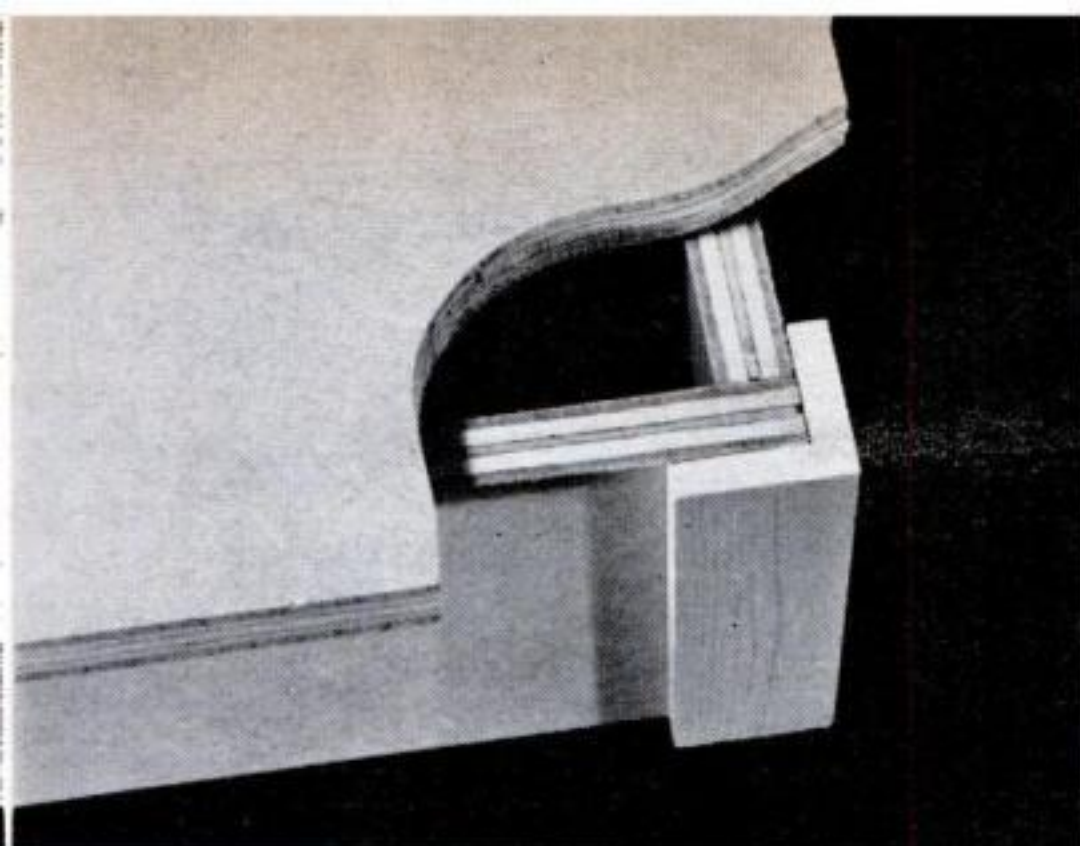
home the peg forces the rail against the notch shoulder. Clamp after peg is in place and drive home the nail. On thin stock, drill a lead hole.

Aligning the parts of a simple miter joint for nailing or clamping when they're glue-coated is difficult. Drive two No. 18 or 19 brads halfway into one edge, snip off the heads with diagonal cutters, and then apply glue. When tacky, press the parts together, clamp or nail.

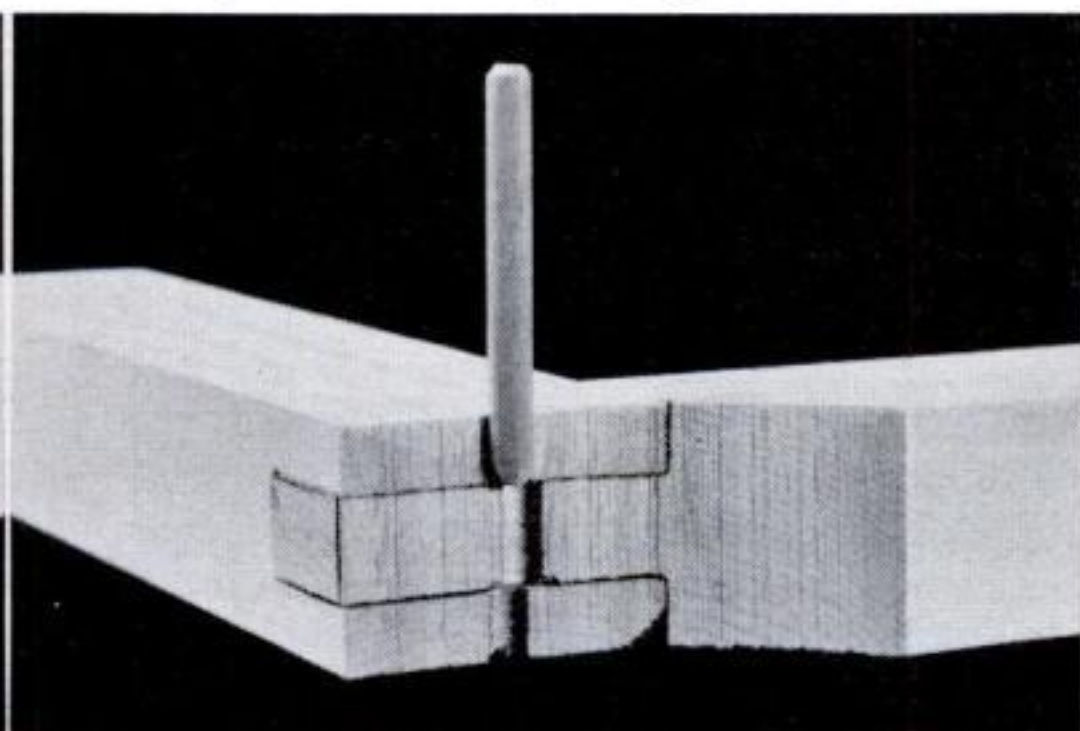
Simple butt joint is often avoided because of its appearance. A cross-miter, used in its place, conceals end grain but provides little more gluing surface. A smooth sanding job on the end grain, plus a shallow rabbet cut across edge of one piece, makes joint more acceptable.

Screws in the end grain of lumber or plywood haven't much holding power. To overcome this, drill a hole through the end-grain piece and plug it with a dowel. Drill lead holes through the dowel before driving in screws. A $\frac{3}{8}$ " dowel will do in stock over $\frac{1}{2}$ " thick.



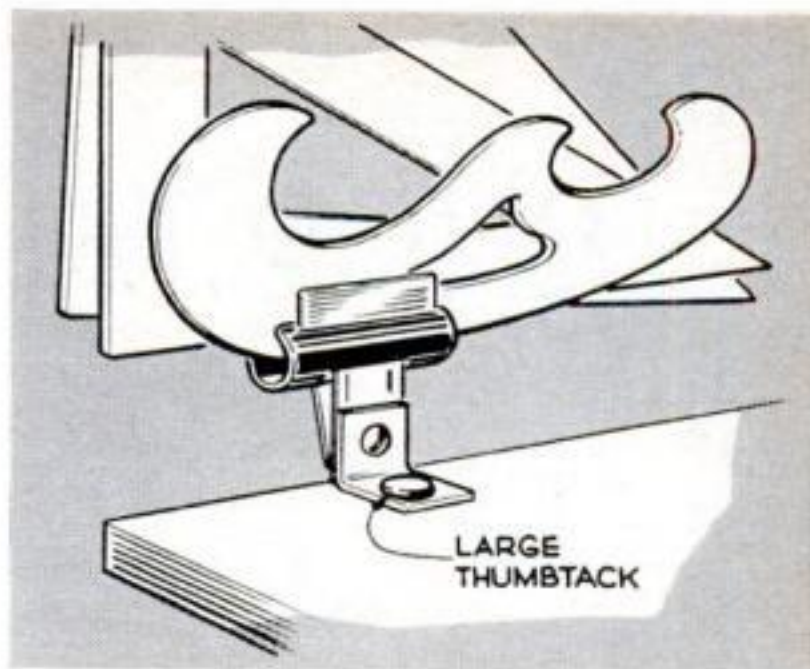
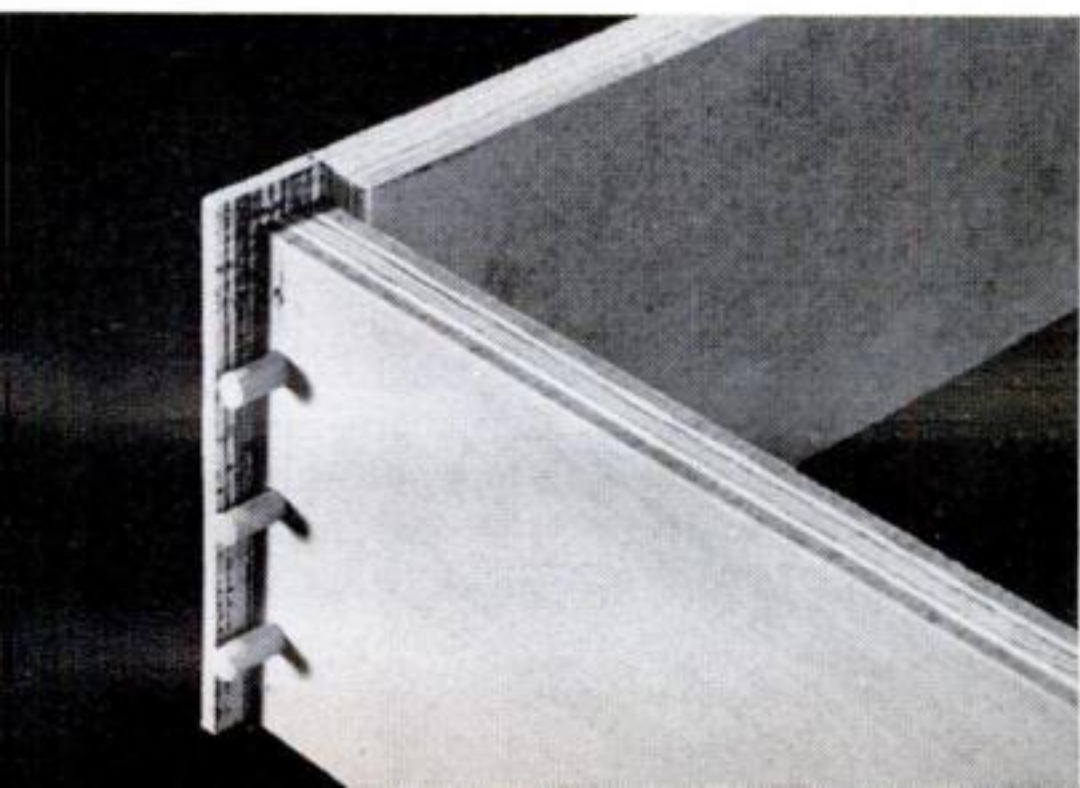


L-shaped cap strip like the one above lets you use butt joints on many plywood projects. It conceals the exposed plies and provides uniform corners. Final appearance is same as inset panels. Attach cap with glue and brads.



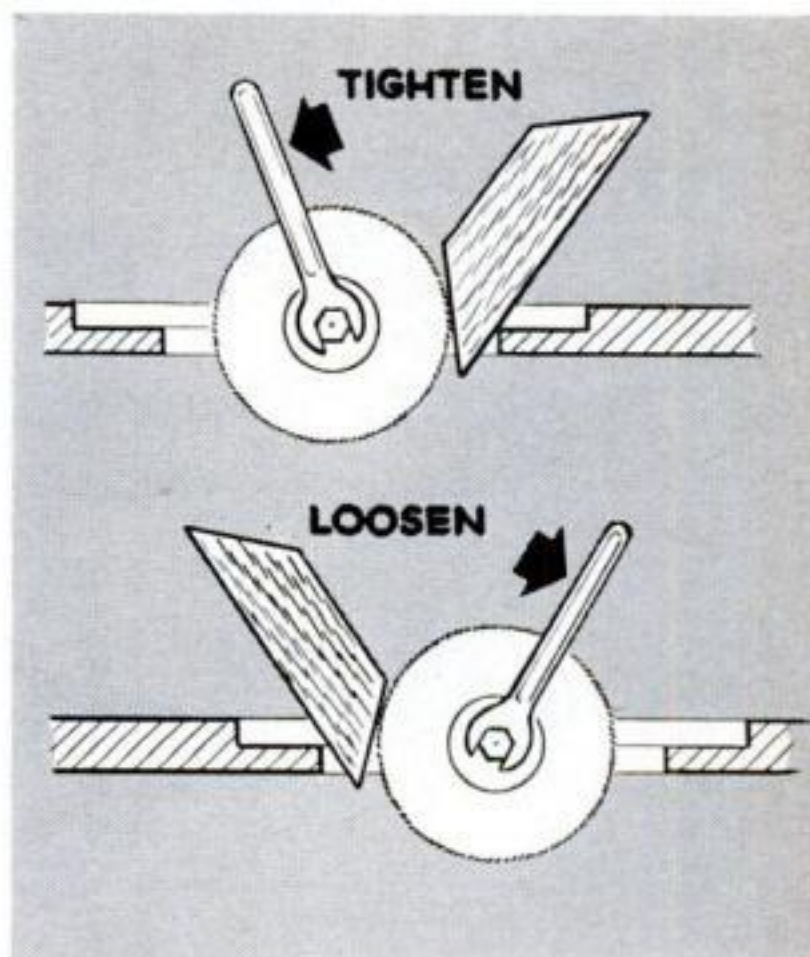
Mortise-tenon joint gains strength when a lock-dowel is used in offset holes. Offset the hole in the tenon by $1/32$ " in hardwood, not much more in softwood. Driving home the dowel pulls the parts together. A bonus: Dowel locks parts so tightly that they need no clamping.

Pegged drawer-front joint is an excellent substitute for a dovetail. Best bet is to apply glue and hold the parts with two finishing nails. Drill the holes and tap in dowels. After the glue dries, cut off excess dowel.



Tool holder for drafting table

A tool holder, made by attaching a spring clip to an angle iron, holds squares and templates within easy reach. The holder is screwed to the board, or is temporarily thumbtacked to it for easy removal when the tools are not in use.
—Peter Legon, Malden, Mass.



No more cut fingers

Nicked a finger recently when your wrench slipped while loosening the arbor nut on your table saw? With my old saw, I have difficulty getting the nut off without a slip. But I've found that I can do it safely by cutting a scrap of softwood and wedging it between the blade and table top. I reverse the process to tighten the blade. With this wedge, I can save time changing blades, and I've been able to avoid serious accidents.
—Edward R. Roberts, Whittier, Calif.

SHOP TALK

By Sheldon M. Gallagher



How to make a battery drill last longer

Owners of shiny new battery-powered drills have been asking us lately if there aren't some special tricks for making the limited power stretch further. Yep, there are. Experts at Rockwell Mfg. Co., makers of a new Porter-Cable battery drill, report that good technique "can increase the number of holes drilled on a single charge by as much as 50 percent." Here's what they recommend:

1) Select the proper bit. The auger type of wood bit uses less power than the flat spade type, especially in hardwood.

2) Keep bits sharp. Dull or improperly sharpened drills waste more power than any other factor.

3) Press hard enough to keep the bit cutting at all times. Insufficient pressure lets the bit skid, using up energy without doing any work. Also, ease off and let the drill speed up just before the bit breaks out. This insures a clean hole and reduces the chance of a "hang-up" that causes a heavy energy drain on the battery.

4) Here's one that may surprise even some old woodworking hands: Coating a bit with a stick lubricant, such as Johnson's Stix-Wax, improves cutting efficiency. In metals, of course, standard cutting oils are a must.

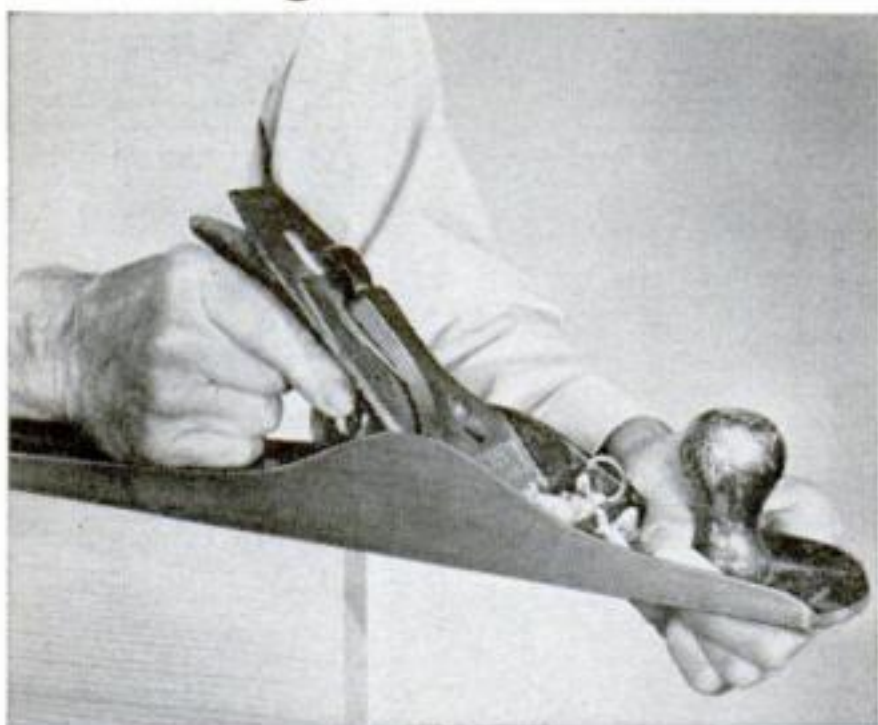
5) Avoid idle running. Turn on the drill only when you're about to start a hole and stop it right afterward.

Good to know:

Special stencils for applying painted designs to furniture, pottery, metals, glass, fabrics, and other materials are now available in a variety of ready-to-use shapes. The decorations, which can be put on with a brush, roller, or spray gun, come in Early American, Pennsylvania Dutch, and other selections of

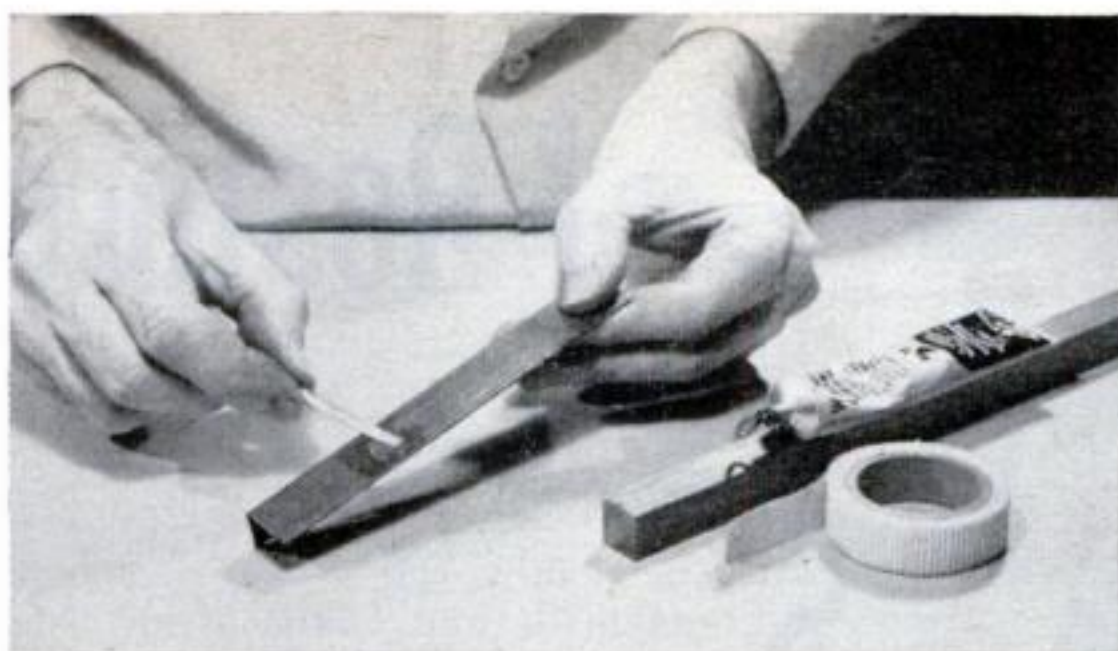
animal, fruit, floral, and symbolic patterns. A set of nine stencils sells for about \$1.25 from E-Z Letter Stencil Co., 6029 Berkeley Ave., Baltimore, Md. . . . Lose a chuck key? Replacements, for all sizes and types of chucks, can now be obtained through hardware dealers, thanks to well-known chuck maker Supreme Products. They sell for about 48 to 72 cents apiece.

What's wrong here?



He'll never get a straight edge on a board this way. Can you spot what he's doing wrong? Turn the page upside down to read the answer: *each pass just as the blade clears the end. straight cut, the plane should be lifted after dubbing off the end of the board. To make a*

The toe of his plane is sagging, a sure way of

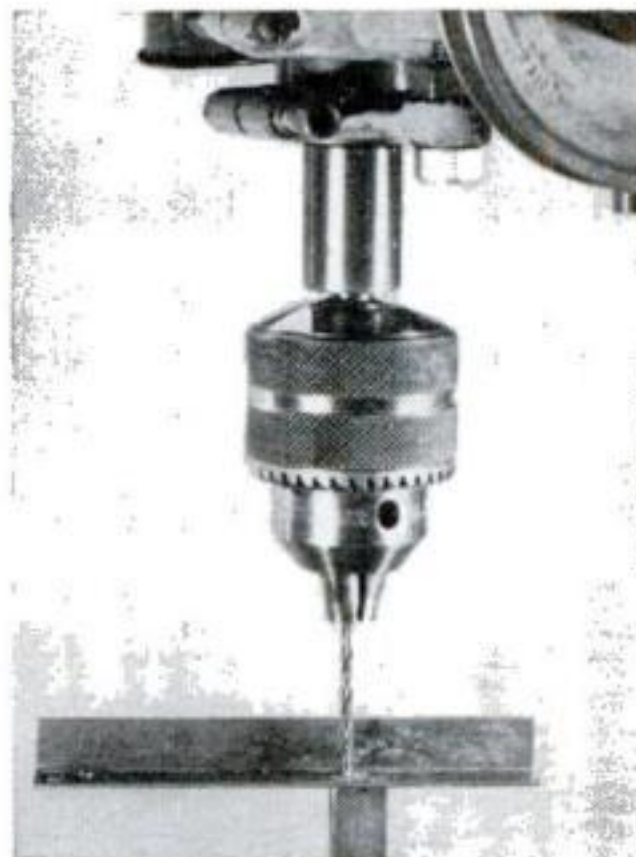


Short Cuts and Tips

FROM
PS
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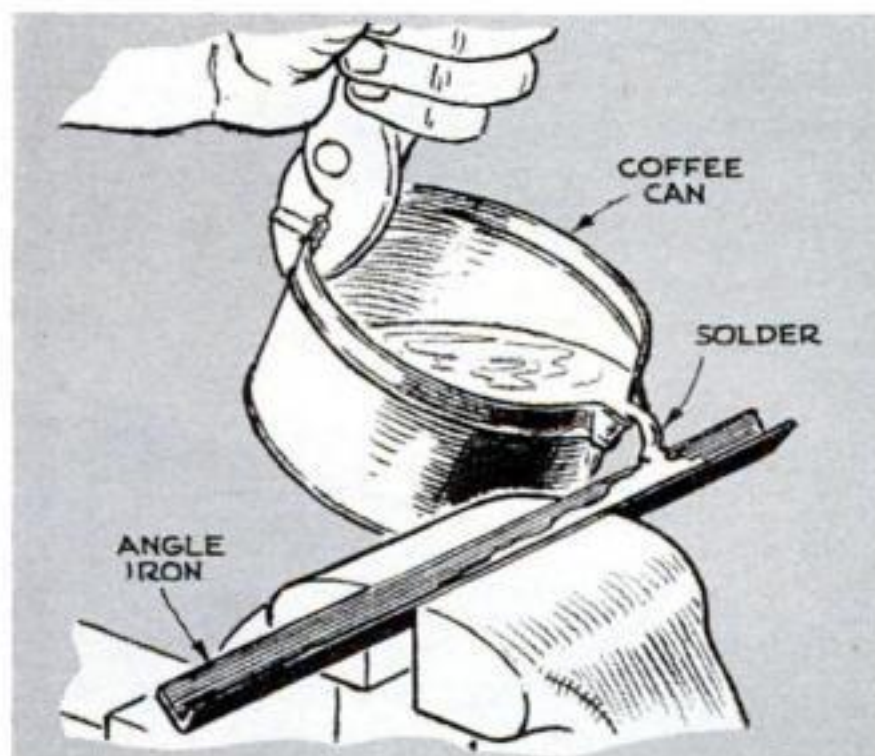
Adhesives hold metal for drilling

When I have a tricky array of metal parts to assemble with bolts or rivets, I save time and prevent error by holding the joints together with adhesive while I drill pilot holes. For this temporary "clamping," I use contact cement or a pressure-sensitive tape with stickum on both sides. I use a small drill bit, one that won't generate too much heat. Excessive heat can loosen the cement or tape and the parts may start whirling under the bit.
—Walter E. Burton, Akron, Ohio.



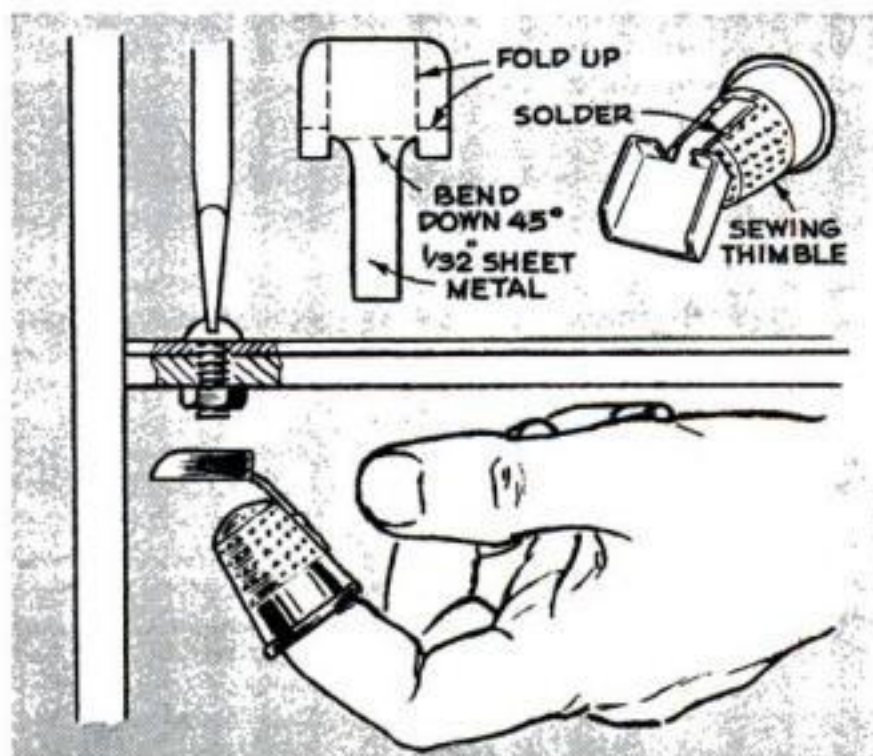
▶▶▶To check my brake lights before backing out of the garage, I mounted two mirrors, one on each side of the door. When I press the brake pedal, a glance into the car's rear-view mirror tells me if a bulb is out.—C. C. Cooley, Detroit.

▶▶▶Do you find that your youngsters can't close sliding closet doors without banging them? Cut four 2" pieces from adhesive-backed foam-rubber window stripping and stick two on each door edge, about a third of the way down and a third of the way up.



Angle iron as a solder mold

For fine soldering, I've found the large bars of solder too bulky. I melt one down and, using a clean angle iron as a mold, recast it in thin strips. If a regular ladle isn't available, a coffee can will do. Pinch a pouring lip on the edge and hold the can over a burner with a pair of pliers.—C. H. Hardy, Whittier, Calif.



Make yourself a "thimble wrench"

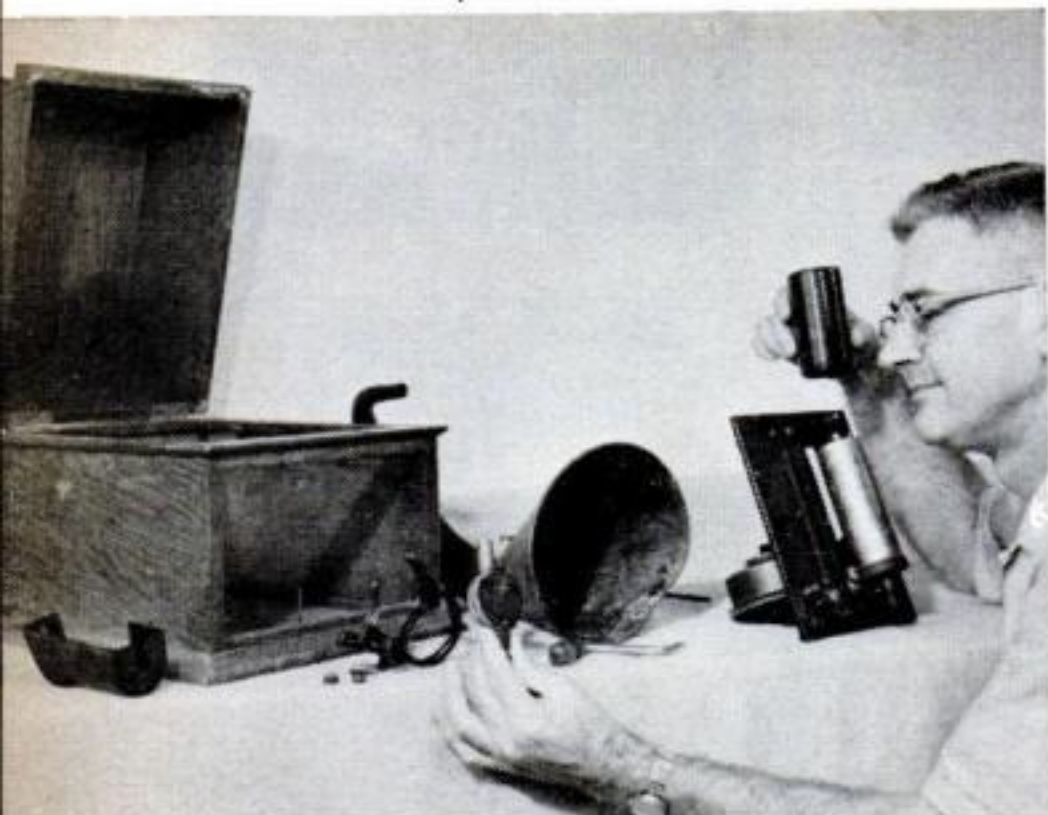
It's difficult to keep a nut from turning when there is no wrench clearance, or where the nut cannot be seen, as in cabinets and behind auto dashboards. Solution: Make a thimble wrench like this one. Placed on the index finger, it stops the nut from turning while you're tightening it.
—Albert T. Pippi, Baltimore.

I Restored

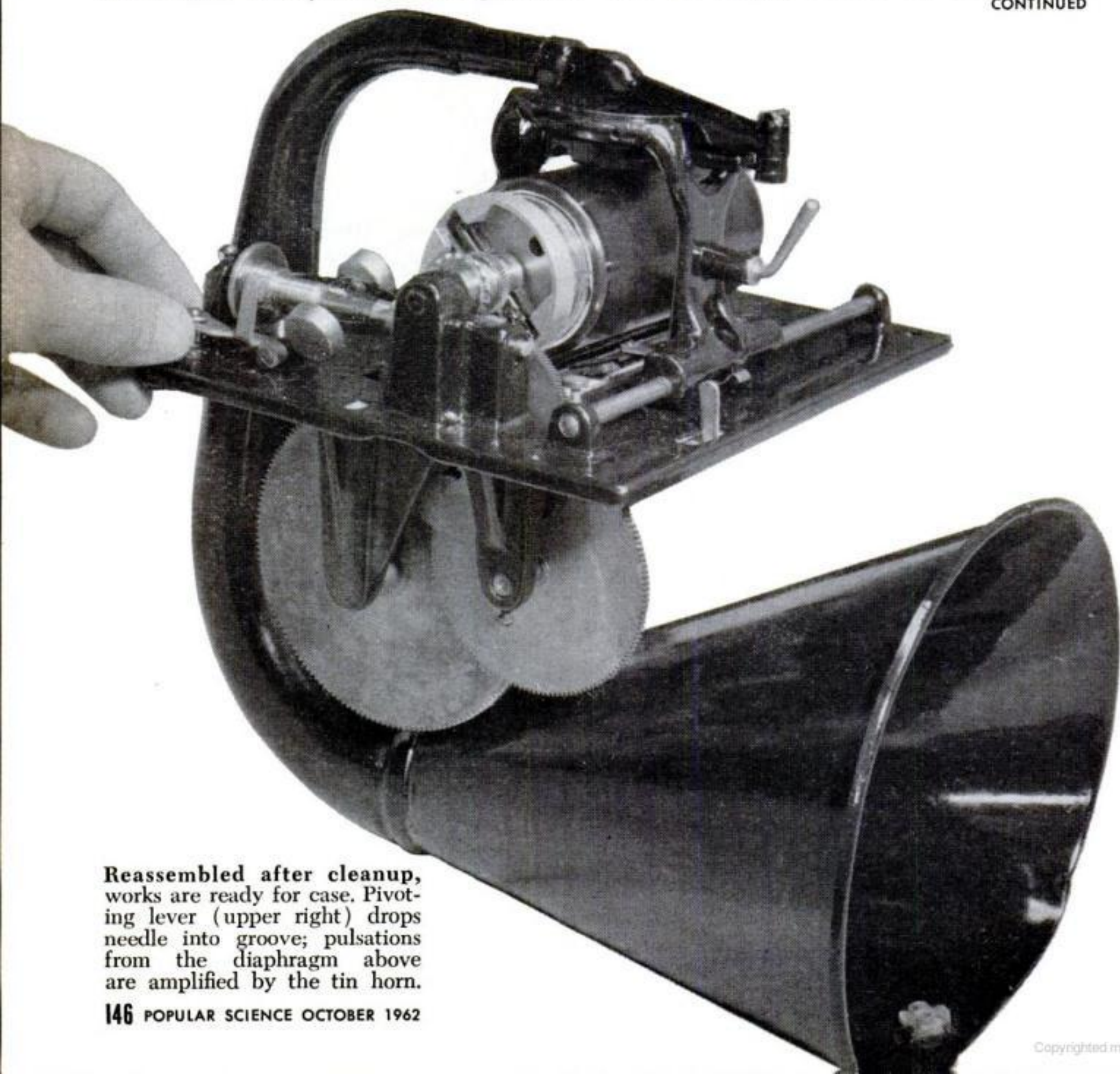
By Herbert G. Eidson Jr.

SOME months ago while rummaging through the dusty attic of my wife's large, old family place in South Carolina, I uncovered a pathetic discard that had once been the prize of the household: a pre-World War I "talking box," complete with one thick wax cylinder. The case badly needed repair and the front grille was nowhere to be found. But inside the hinged wooden top there was a

CONTINUED

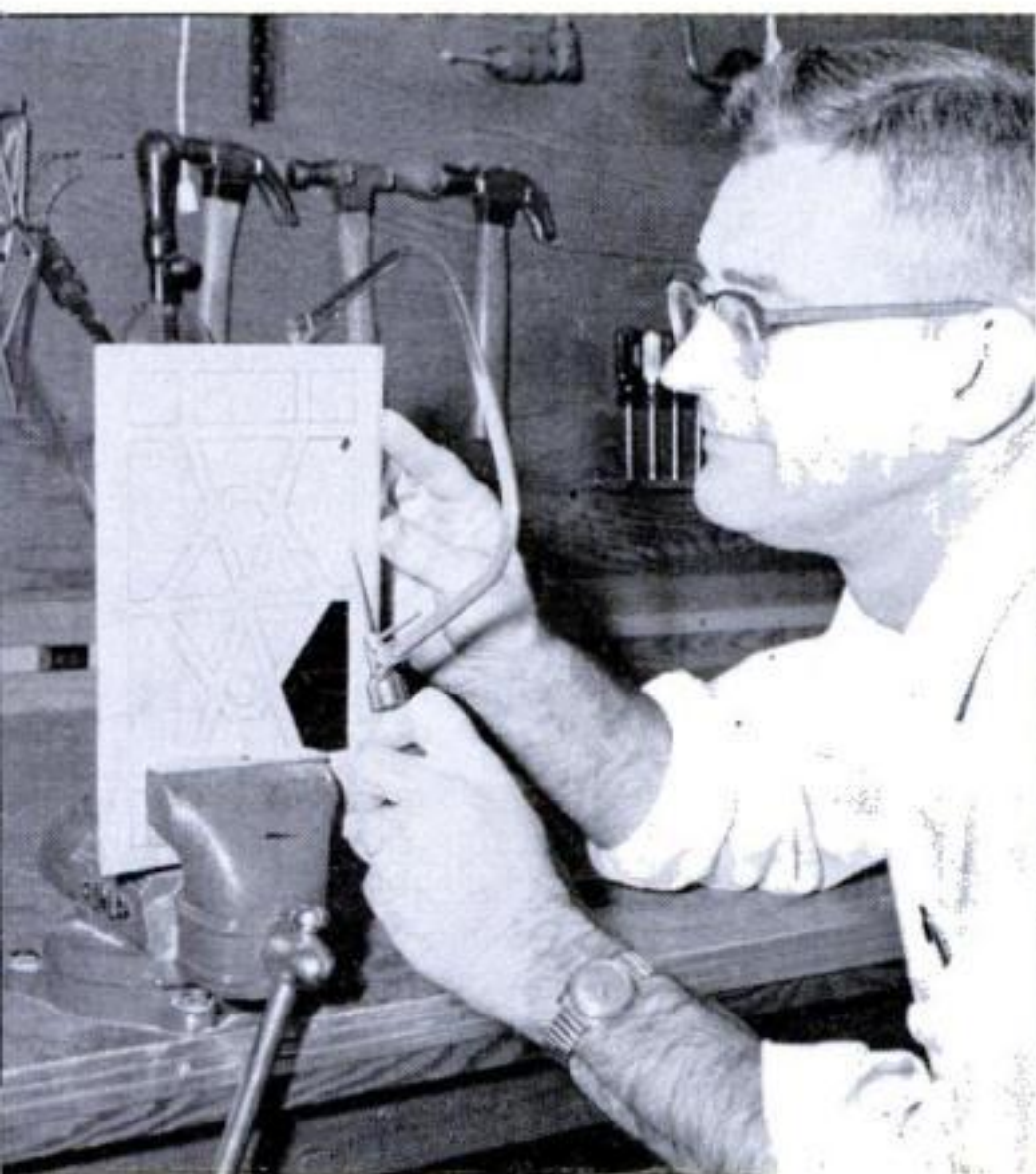


Sad state of old Edison is evident from this photo of initial disassembly. Battered case had grille missing; works were clogged with dirt. Author holds wax cylinder in his right hand.



Reassembled after cleanup, works are ready for case. Pivoting lever (upper right) drops needle into groove; pulsations from the diaphragm above are amplified by the tin horn.

an Antique Phonograph



Making new grille of own design (he felt authentic design too plain), author copes it from $\frac{1}{8}$ " plywood. Each cutout needs starting hole.



So it's not hi-fi—it still works (and looks) as well as it did 50 years ago. And a wide selection of old cylinder records is available.

Before disc records, cylinder phonograph was the thing

The first machine to reproduce sound was patented by Thomas A. Edison in 1877—a tinfoil-wrapped metal cylinder, turned with a crank. Though Edison intended it as a business machine, it became a household must. Types below: left, Amberola 30 (the 1915 model the author restored); far right, a console version (Model 75). Between are sets issued before 1900: Gem and Concert (top), Home and Triumph.



brass plate inscribed: AMBEROLA No. 30, Thomas A. Edison, Inc., Orange, N.J. (I learned later the model number was a price code: In 1915 this machine sold for \$30.)

Even though the main spring had been left under tension and the gears were caked with black grease and the dirt of many years, I was able to make the old cylinder turn a few times on its own. But I couldn't

Cylinder-Phonograph Family Tree

For nearly 30 years, "improved" Edison phonographs appeared with the regularity of today's new model cars. The list below will identify almost any machine you may want to restore.

Name	Type	Date
Spectacle	Battery	1887
Spectacle	Foot Power	1889
Spectacle	DC	1889
Victor Diaph.	Battery	1889
Balmoral Diaph.	Battery	1889
Conquerer Diaph.	DC	1889
Treadle Diaph.	Foot Power	1889
Talking Doll	Hand Power	1889
Water Motor	Water Power	1890
Triumph	Spring Motor	1895
Home	Clockwork	1896
Home	Spring Motor	1896
Concert (4")	Spring Motor	1896
Standard	Spring Motor	1897
Opera (Concert)	Battery	1898
Oratorio (Concert)	DC	1898
Gem	Spring Motor	1898
Idelia	Spring Motor	1908
Fireside	Spring Motor	1909
Amberola A-1	Spring Motor	1909
Opera (Concert)	Spring Motor	1911
Opera (School)	Spring Motor	1912
Amberola B-III	Spring Motor	1912
Amberola IV	Spring Motor	1913
Amberola V	Spring Motor	1913
Amberola VI	Spring Motor	1913
Amberola VIII	Spring Motor	1913
Amberola A-X	Spring Motor	1913
Amberola 30	Spring Motor	1915
Amberola 50	Spring Motor	1915
Amberola 75	Spring Motor	1915

Thomas Edison's portrait identified famous Blue Amberol records. Cylinder slipped onto revolving drum to provide four minutes of music or comedy.

convince myself that the scratching noises coming from the horn were really music. Here, then, was a challenge—could I restore this old set to its former glory?

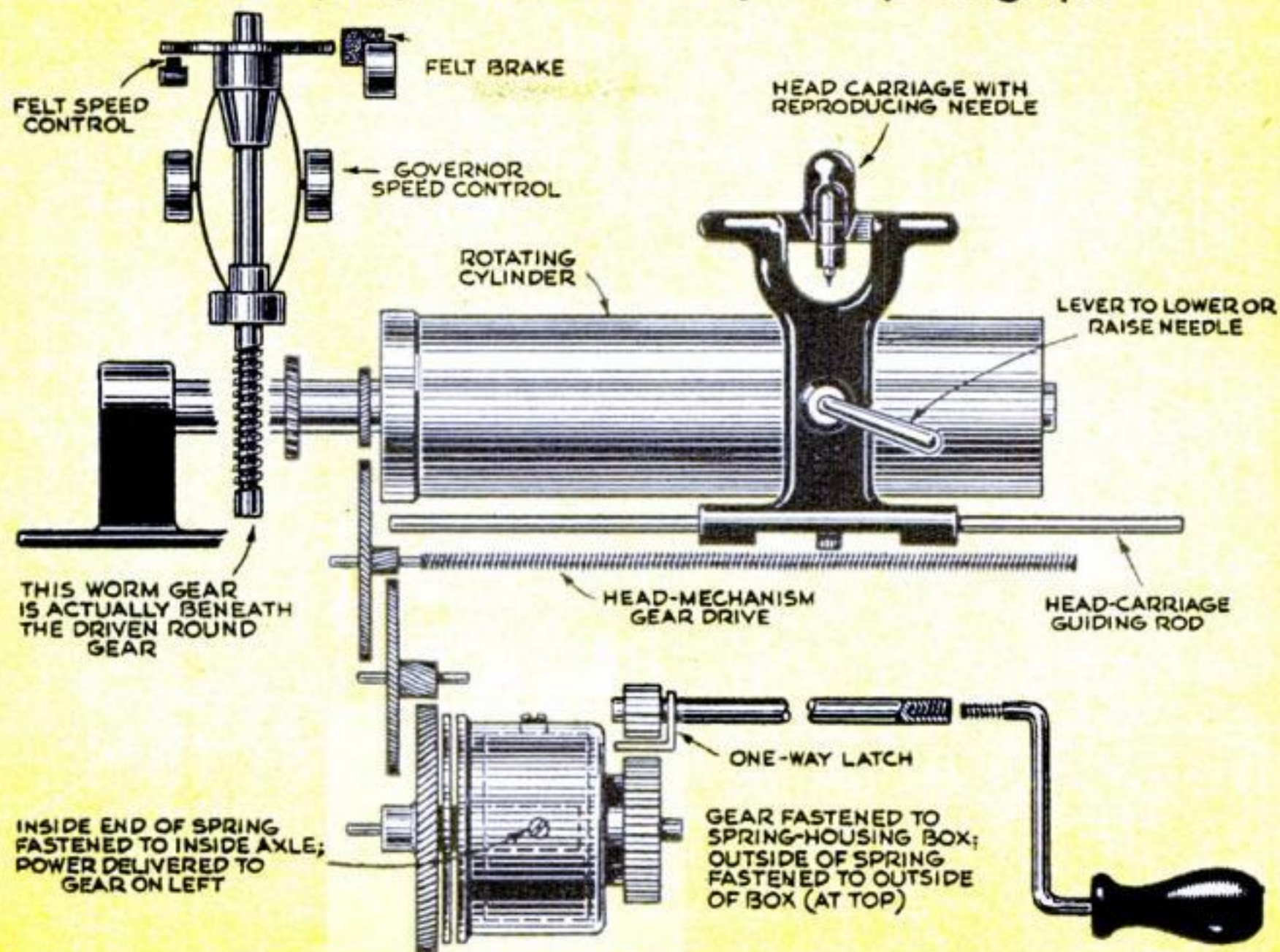
Refurbishing the metal parts. First came the spring motor on its cast-iron motor board. I lifted it out of the phonograph cabinet and disassembled the motor and gears. All parts (except the head containing the diaphragm, and the tin horn) were placed in kerosene to soak for several days. The dried grease and dirt gave way under scrubbing with a stiff toothbrush. The rust was removed with sandpaper and steel wool. All gears and associated parts were made bright with fine steel wool, and—with the exception of the teeth—given a coat of clear lacquer to prevent rusting. The motor board and horn got a coat of black enamel. I filled the mainspring and housing with a light grease, then assembled and greased all gears, along with the weighted governor.

Repairing the cabinet. Kerosene and brushes were used to scrub the wooden housing inside and out. I decided that the cracked top veneer could be salvaged, so I removed the hinged wooden top and forced a thin mixture of plastic-resin wood glue under all the wrinkled spaces where the veneer had left the main wooden top. I placed a heavy piece of plate glass on the

[\[Continued on page 210\]](#)

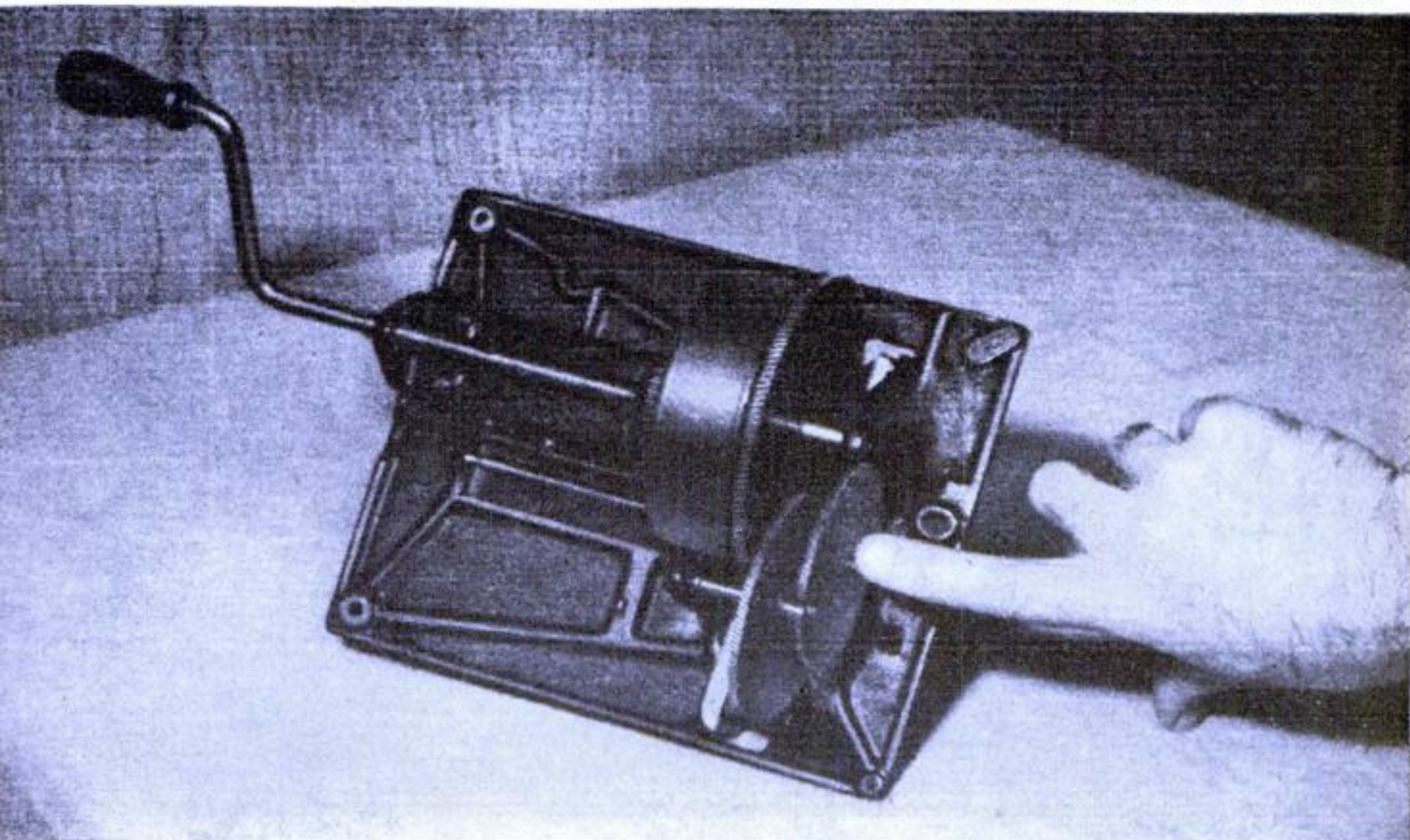


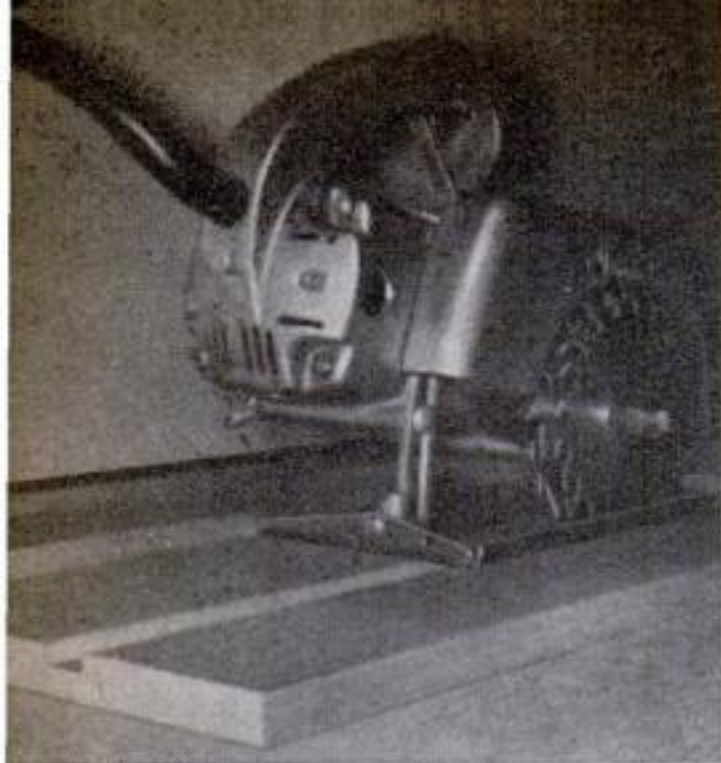
Here's how a spring motor drives a cylinder phonograph



Underside view of cast-iron chassis shows assembly of drive gears sketched above. Crank winds up spring within housing; when governor brake is released, spring delivers power to

double-duty gear (at fingertip) which rotates cylinder and is mounted on rod that has threads spaced same as grooves on record. Spinning rod moves head carriage along cylinder.





Make your own Dado Accessory for a Portable Saw

By C. Robert Percival

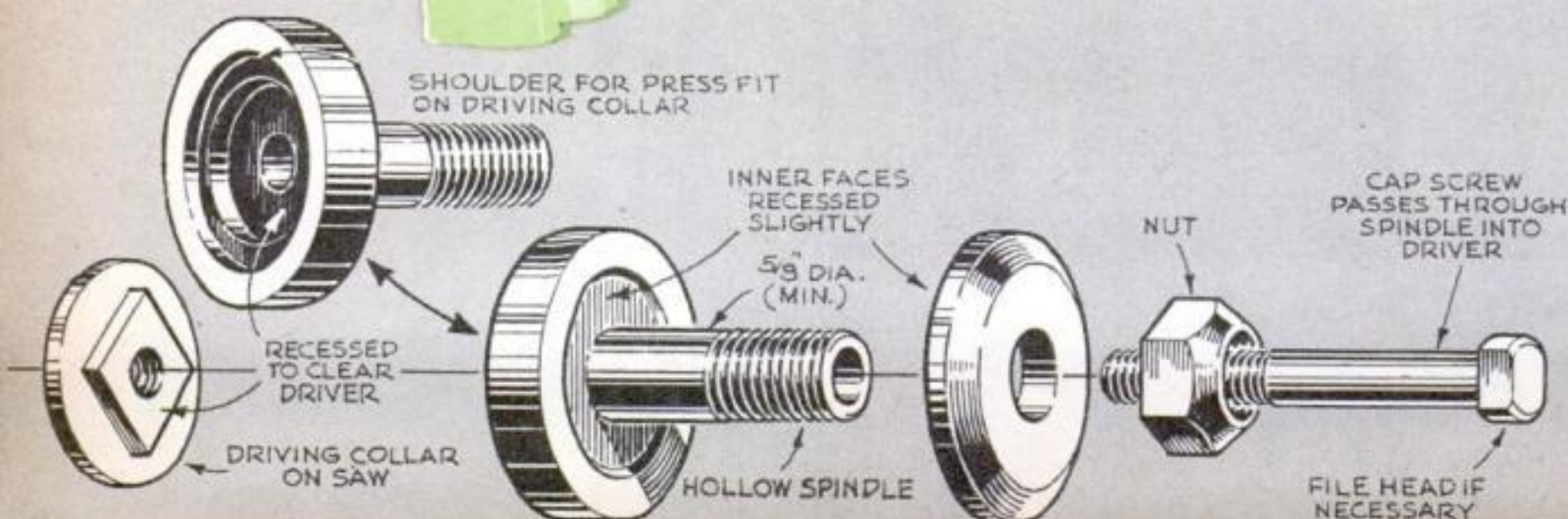
THE portable circular saw above is giving an unusual performance—it's cutting a $\frac{3}{4}$ " dado in one pass. A guide strip tacked to the face of the work assures a straight cut exactly where needed. It's done with a simple accessory machined in a home shop that permits ganging blades and chippers for dados of any width desired. The regular saw adjustments determine the depth of the cut.

This extra use for a portable saw comes in very handy. You can groove long boards at the work site. No need to wrestle them into the shop. And you can cut neat, accurate dados in wide panels that would be awkward to feed through a table saw. To attempt such work by means of repeated passes with a single saw blade involves tedious resetting of edge guides or face strips.

The adapter is a hollow spindle, turned down to the arbor diameter of a dado. You start with large-diameter bar steel so you can leave a wide collar at one end to fit over the driving collar on the saw. From the same diameter stock, turn a washer to clamp against the other face of the dado blades. The assembly is attached to the saw with a cap screw—one as long as the threads in the saw will take and still draw the head up flush and tight. You may have to file the head so the nut will slip over it when the unit is attached to the saw.

For wide dados, you might also have to file the slot in the base. On most saws you'll be able to lock the guard in a retracted position. On mine, I drilled a $1/16$ " hole through both halves of the guard and wired it up. This lets me mount dados up to 5" diameter. I make the pass slowly, holding the machine down with both hands.

The assembly can be removed as a unit, and replaced quickly without disturbing the width setting. I've used the accessory in a custom cabinet shop for 15 years—as well as in hobbywork—and wouldn't be without it.



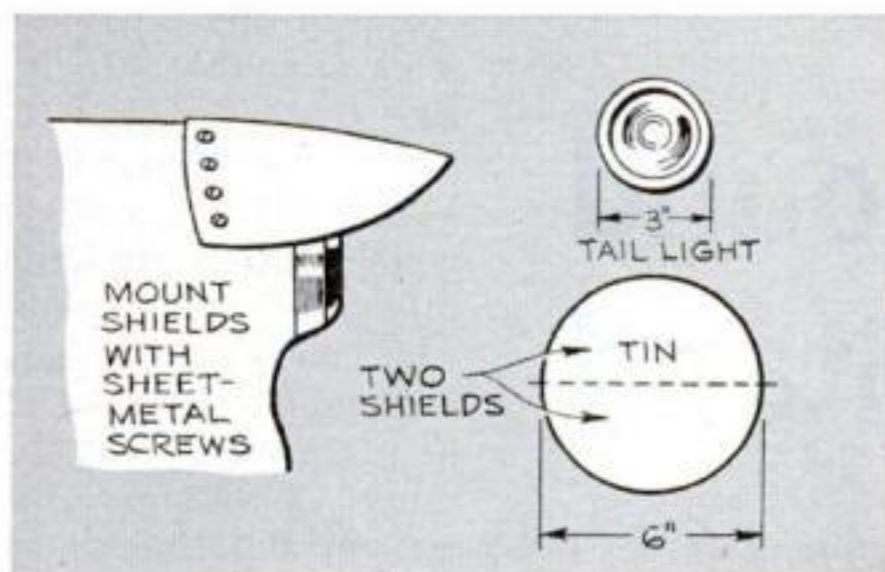
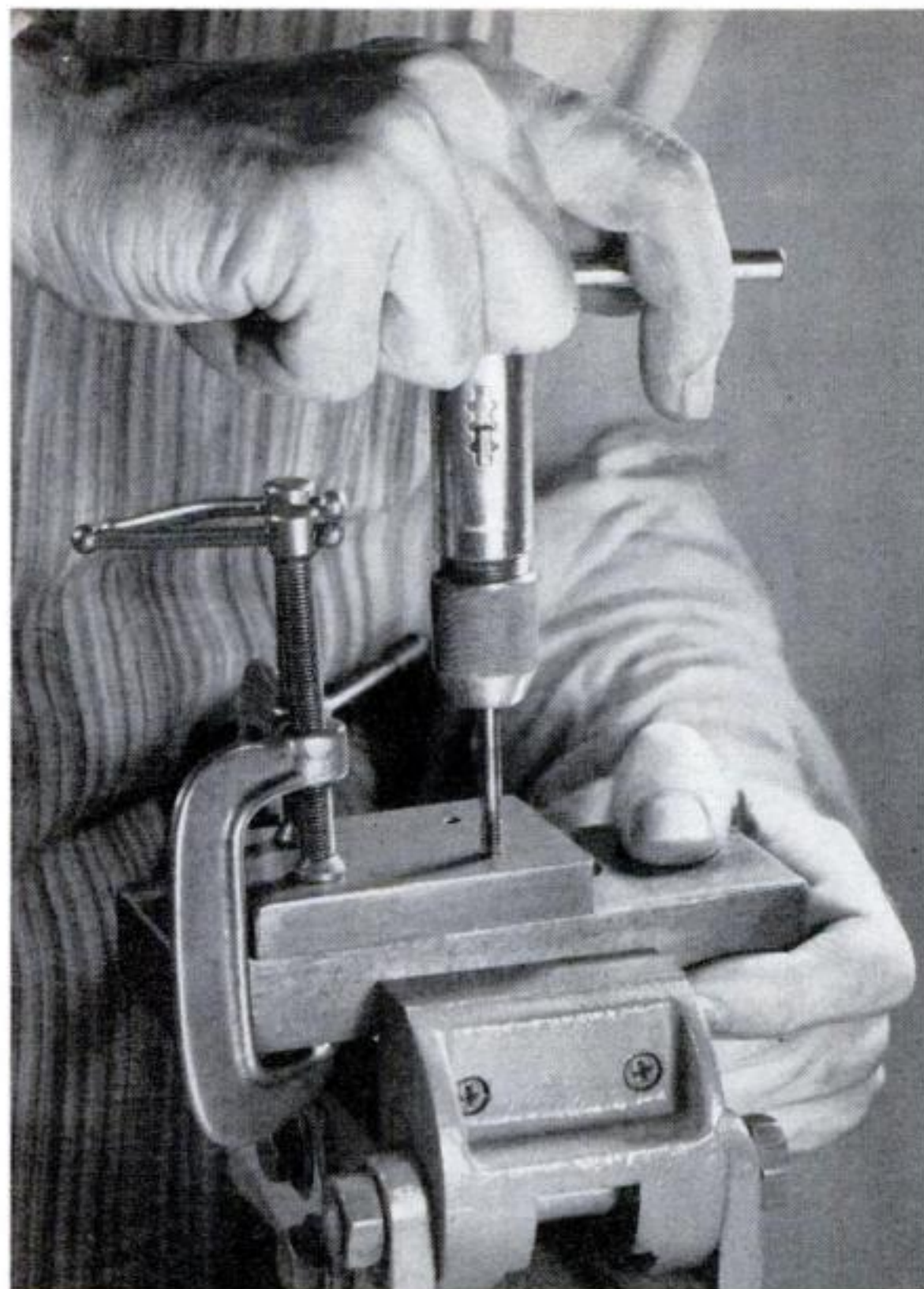
Short Cuts and Tips

FROM
PS
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Guide bushing is good tap insurance

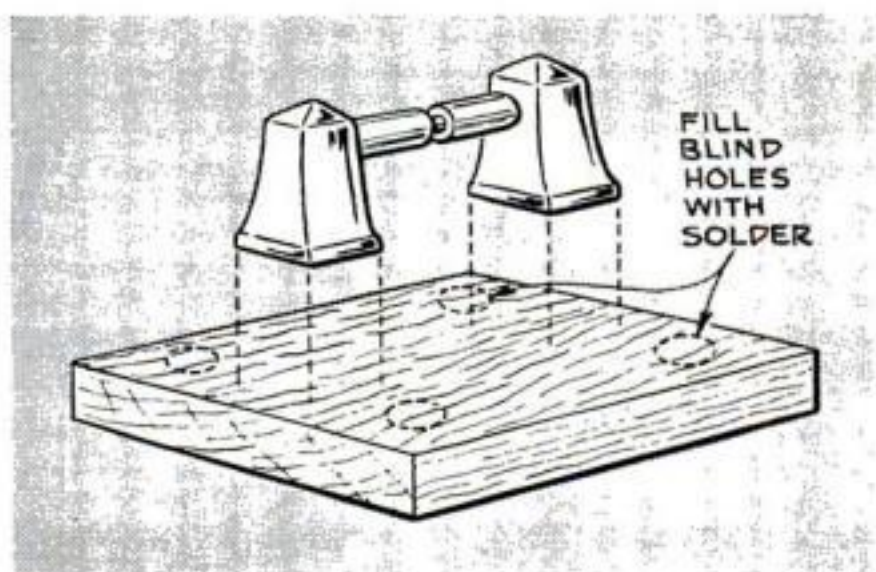
When a tap breaks during a hand-threading operation, it usually snaps so close to the metal that you can't grasp the stub for removal. To avoid such a pickle, drill a hole in a piece of $\frac{1}{4}$ " steel just large enough for the tap to pass. Align this template hole with the one in the work and clamp the steel in place. If the tap breaks, remove the template and you have a stub to get hold of.—*W. E. Burton, Akron.*

▶▶▶ When I burn leaves in the fall, the discharge chute of my rotary power mower makes a good draft to keep damp leaves burning. I set the motor at just above idling speed and aim the chute at the base of the pile.—*J. Menchhofer, Indianapolis.*



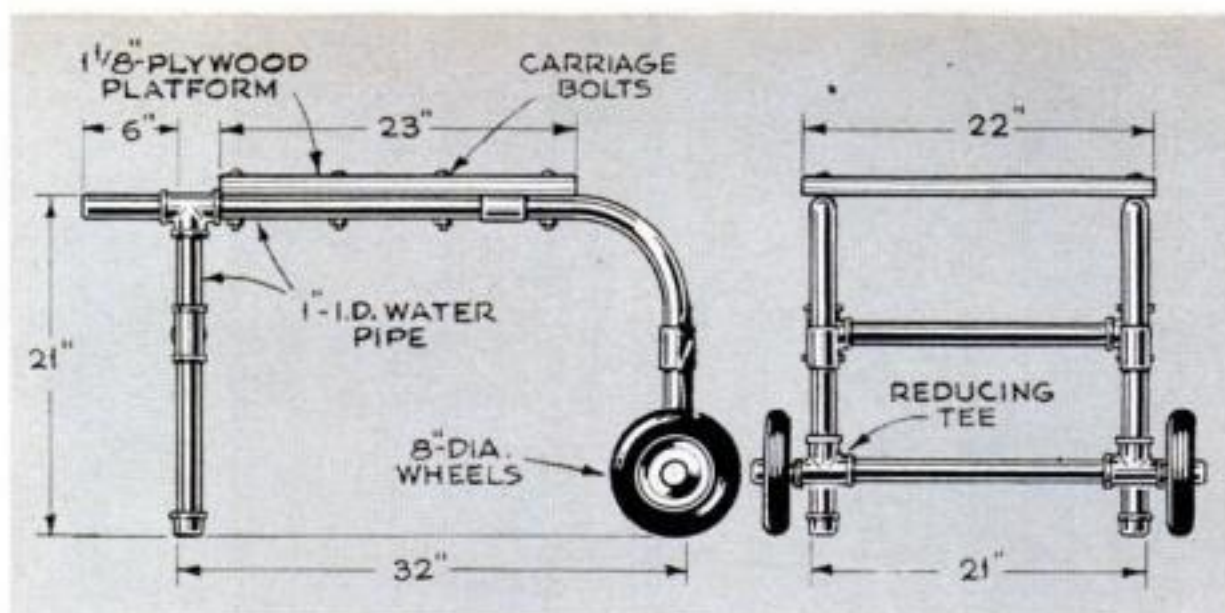
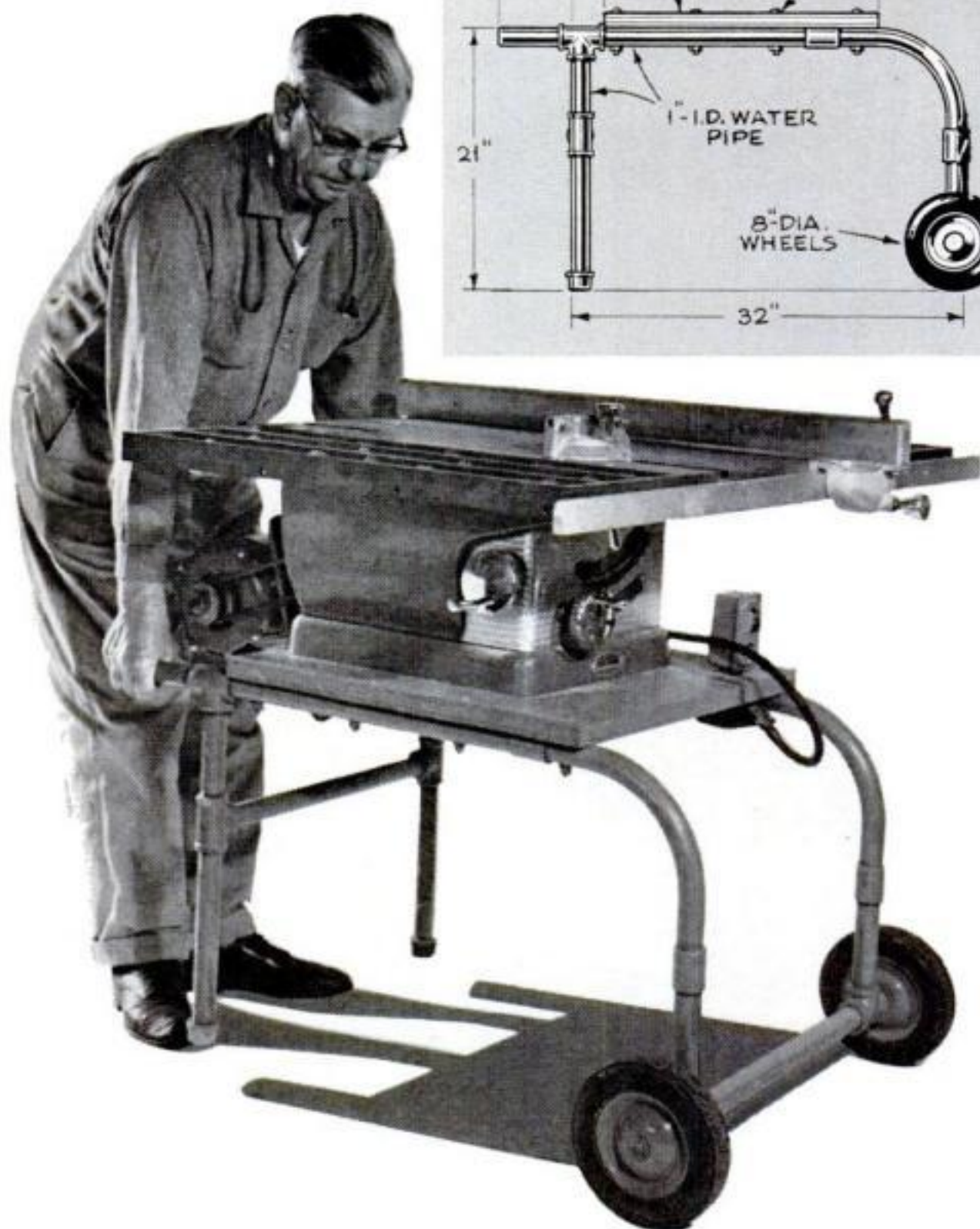
Shields prevent tail-light breakage

It seems to me that someone ought to sell accessory shields to prevent breakage of tail lights on pickup trucks. We use a pickup for a lot of small jobs. Within the past year, four lights have been broken. But there'll be no more. I've now made and installed two shields as shown, cutting and forming them from light steel.—*Kenneth Hardy, Helena, Ohio.*



Portable tissue holder stands anywhere

When a new baby took over in our house, my wife used toilet tissue instead of more costly facial tissue for all sorts of mopping-up operations. The roll was hard to manage with one hand and often rolled to the floor. I bought a tile paper holder made for insertion in a bathroom wall. Mounted on a weighted wooden base, it works fine.—*Howard Jenkins, Ohiopyle, Pa.*



Wheel-Around Saw Stand

WHY a wheel-around stand for a table saw? Because a barrowlike stand makes it easier to swing the saw into position for ripping four-by-eight panels or long lumber. And you can roll it out of the way when sweeping up—or outdoors for on-the-job cutting.

The stand must be wobble-free. That means an exceptionally sturdy structure. You get this by using 1"-inner-diameter black water pipe. It's inexpensive.

The stand shown was made from stand-

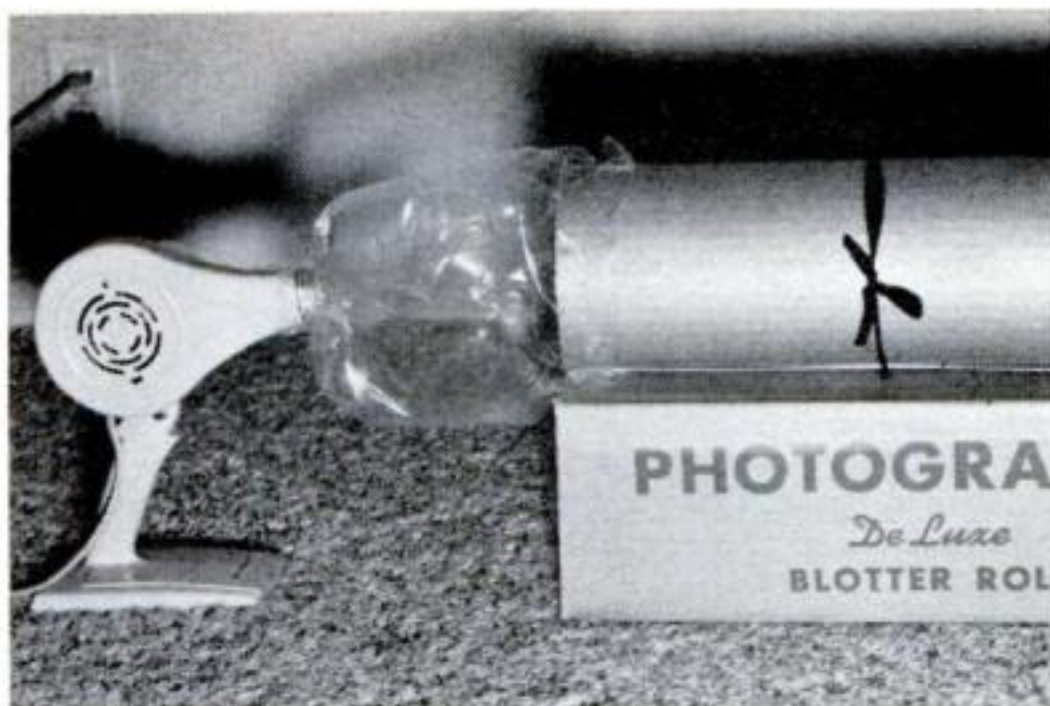
ard fittings, stock-length ready-threaded nipples, and machine-bent 90-degree pipe sections—all normally available at local plumbing-supply houses.

Begin assembling the pipe at the front cross-brace (the axle) and work toward the handles. Clean off each threaded joint with solvent and smear the threads with epoxy-based auto-body solder before wrenching it up.

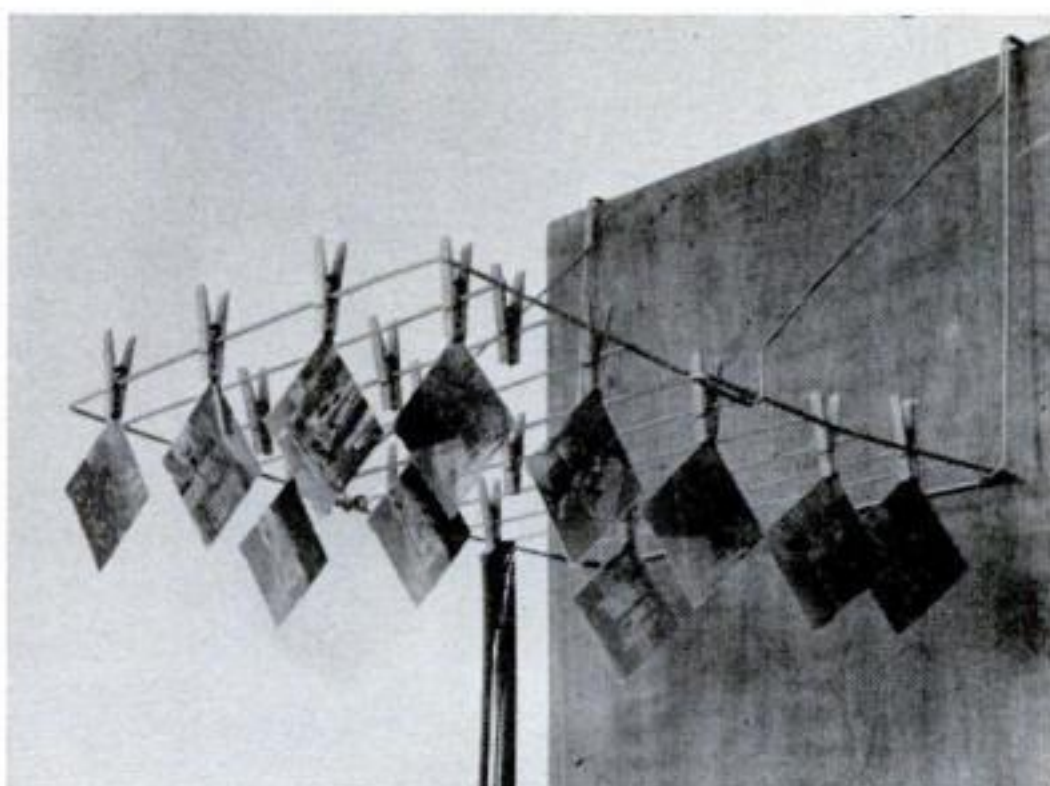
All joints but one screw together. In fitting the last length of pipe, the crossbrace below the handles, you'll find right-hand threads on both ends. This means that only one end can be screwed in place. Drive-fit the other. Grind off the

pipe threads and rasp out the threads in the fitting. Epoxy-solder the joint, drive pipe and fitting together, and drill the fitting for a riveted pin.

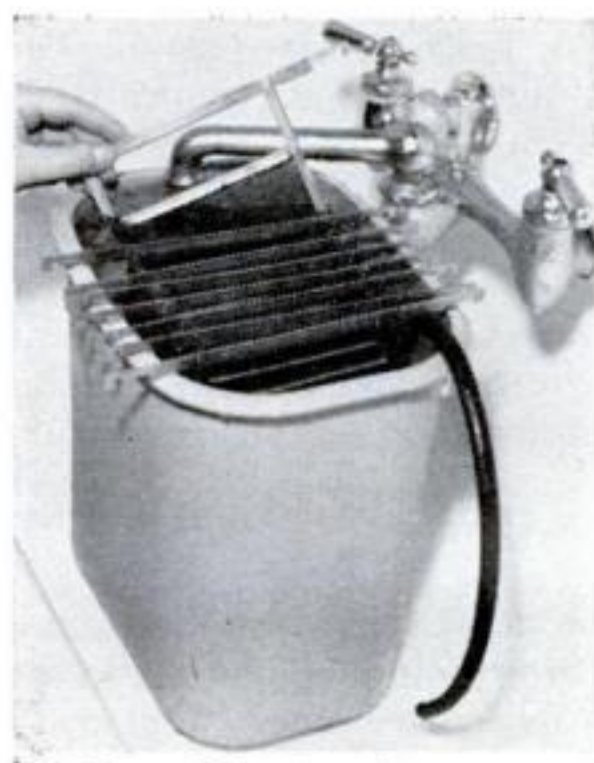
Screw two reducer bushings into each lower front tee fitting, slip a length of cold-rolled shafting through the bushings, and key on 8" wheels. Finish the metal with auto enamel. Bolt on a 1 1/8" plywood platform for the saw. If material of this thickness is unavailable, use two 3/4" sheets.—*John Burroughs.*



For rapid print drying, use a hair dryer to blow air through a blotter roll. A polyethylene sack, held in place by rubber bands, directs the flow through the blotter roll. To enlarge the roll for minimum print curl, roll the blotter around a mailing tube.



Drying roll and sheet film is simplified by using an over-the-door clothes-drying rack and some spring-type clothespins on rungs of the rack. After the negatives are dry, the rack can be unhooked, folded, and stored.



A plastic wastebasket and a short length of hose for siphoning makes a good sheet-film washer for use under a sink or bathtub faucet. The basket can hold up to 18 4-by-5 film hangers.

Plastic bleach bottle offers one more way to make a no-cost film washer. Cut off the top, and punch holes around the bottom—enough for a change of water every five minutes.

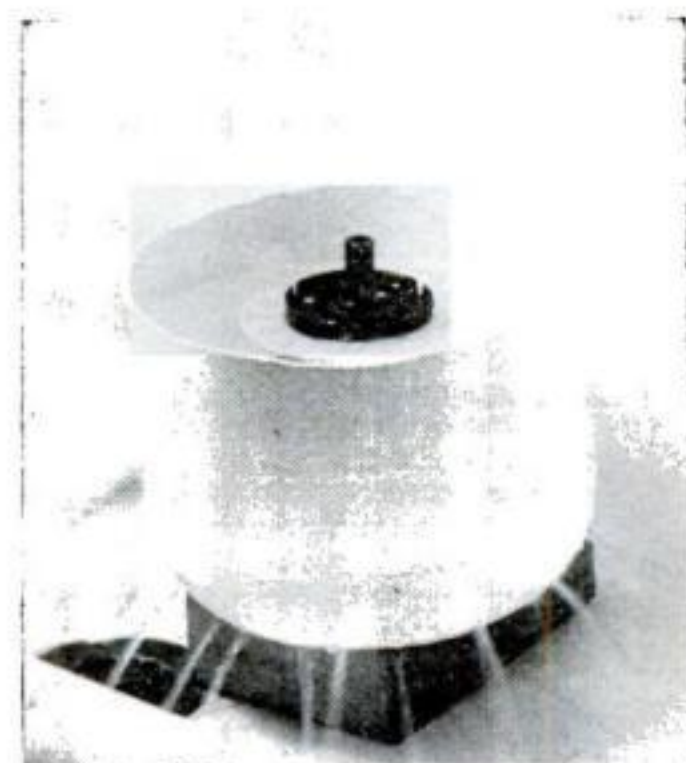
PS PHOTOGRAPHY

Smart Make-Do for the Darkroom

Handy items do the job—and save you money



Half-gallon ice-cream containers of plastic make fine tanks for wetting agent. You mix, use, and store solution in same container.



HOW TO MAKE A Ring Light for Shadowless Photos



By John Burroughs

ARRANGE eight porcelain sockets around a camera lens, wire them up, screw in eight bulbs, and you have a ring light. Your first experiments with it should convince you that it's a lighting tool you can't do without. It's slick for portrait shooting, technical photography, copying, and scads of other jobs.

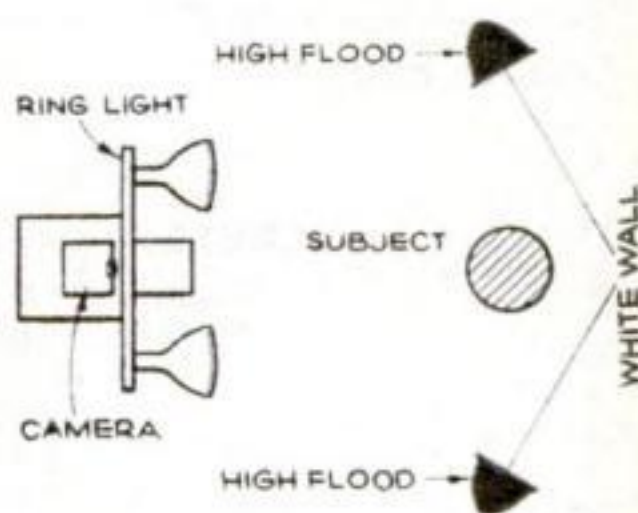
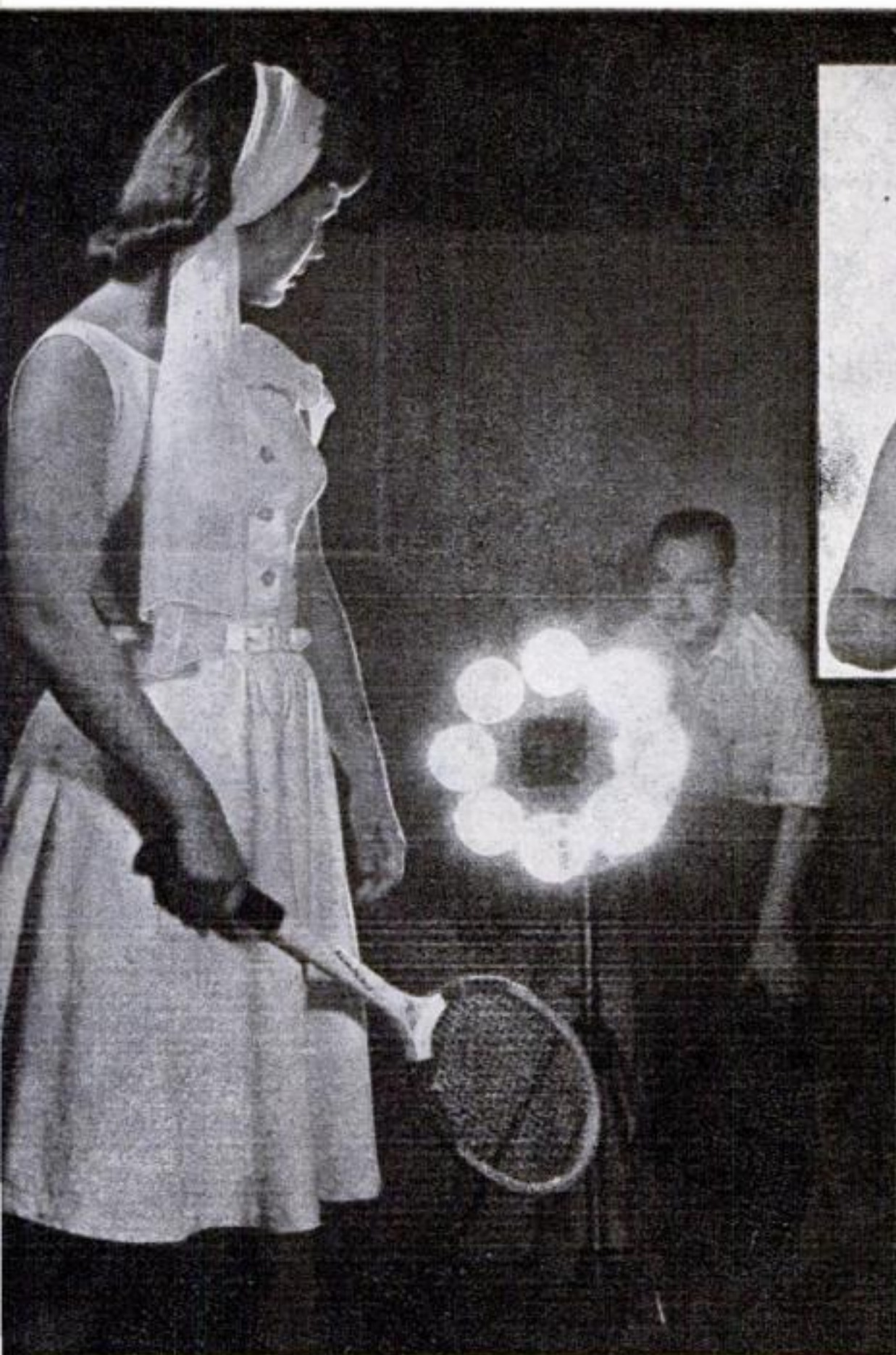
Surrounding the lens, the ring of bulbs bathes the subject with shadowless front light, relatively low in intensity and beautifully effective in wiping out harsh, unflattering lines and shadows.

Indoor photo setups ordinarily are lighted

with multiple light sources arranged to control highlight-to-shadow contrast. But arranging several light sources is a tricky business. Unless the lights are balanced with considerable skill, they cast unnatural crisscross shadows.

With its directionless lighting, a wrap-around ring light automatically licks both excessive contrast and secondary shadow problems. The soft light of the ring fills in shadow areas enough to bring it within the contrast range of the film. When properly used, the ring itself casts no shadows. Result: full tonal range and natural-looking prints or transparencies every time.

To light portraits and subjects of compa-

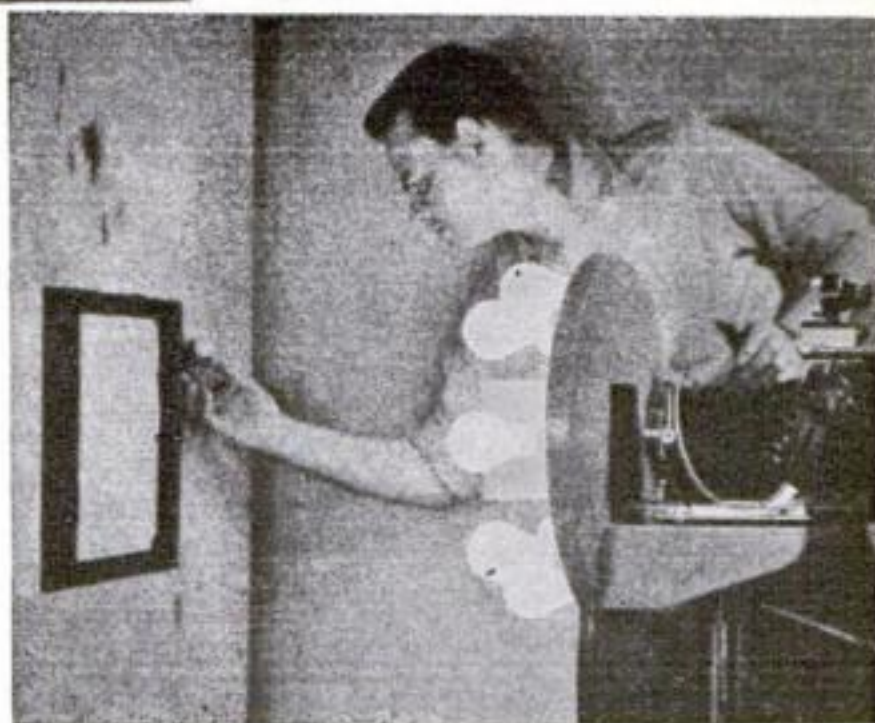


Original ring-light setup, as Fred Peel used it, is diagramed above. The ring light supplied front illumination; the background was lighted separately with floods, some of the spill falling on the subject. Shots may be banged off without readjusting lighting arrangement.

rable size, team your ring light with a key light—either a single photoflood or reflector spot. With the key light above eye level, at approximately a 40-50-degree angle to one side of the subject, switch on the ring light to provide low-intensity fill-in illumination.

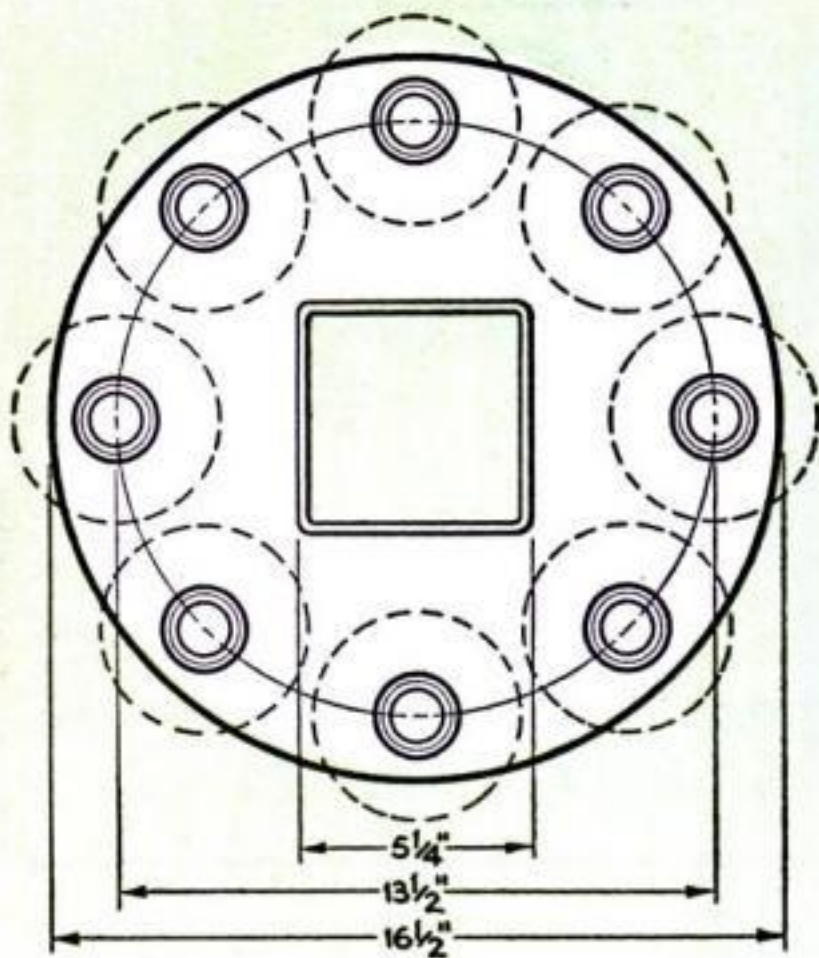
You can vary the light output of the ring light by interchanging bulbs. Household 60- or 100-watt bulbs provide enough light for most black-and-white shooting. For subjects at greater distances, PAR-38 reflector-type bulbs throw light farther. The new midget DAN reflector-type photofloods deliver a blast of light for color work.

Using this simple lighting arrangement, you can bang off good shots as fast as you

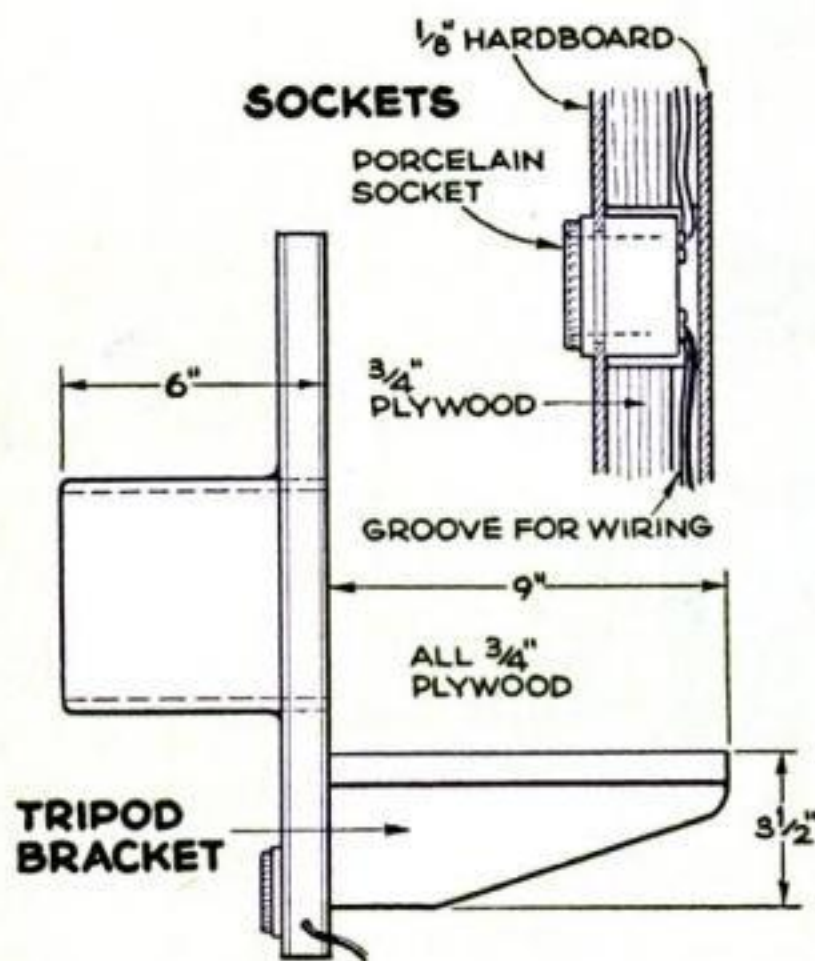


To copy documents or drawings with a ring light, substitute ordinary 100- or 150-watt bulbs for the reflector floods. The bulbs will give sufficient light for one-second exposures even on slow film. Keep camera face parallel to subject.

Assembling the ring light is easy—just .



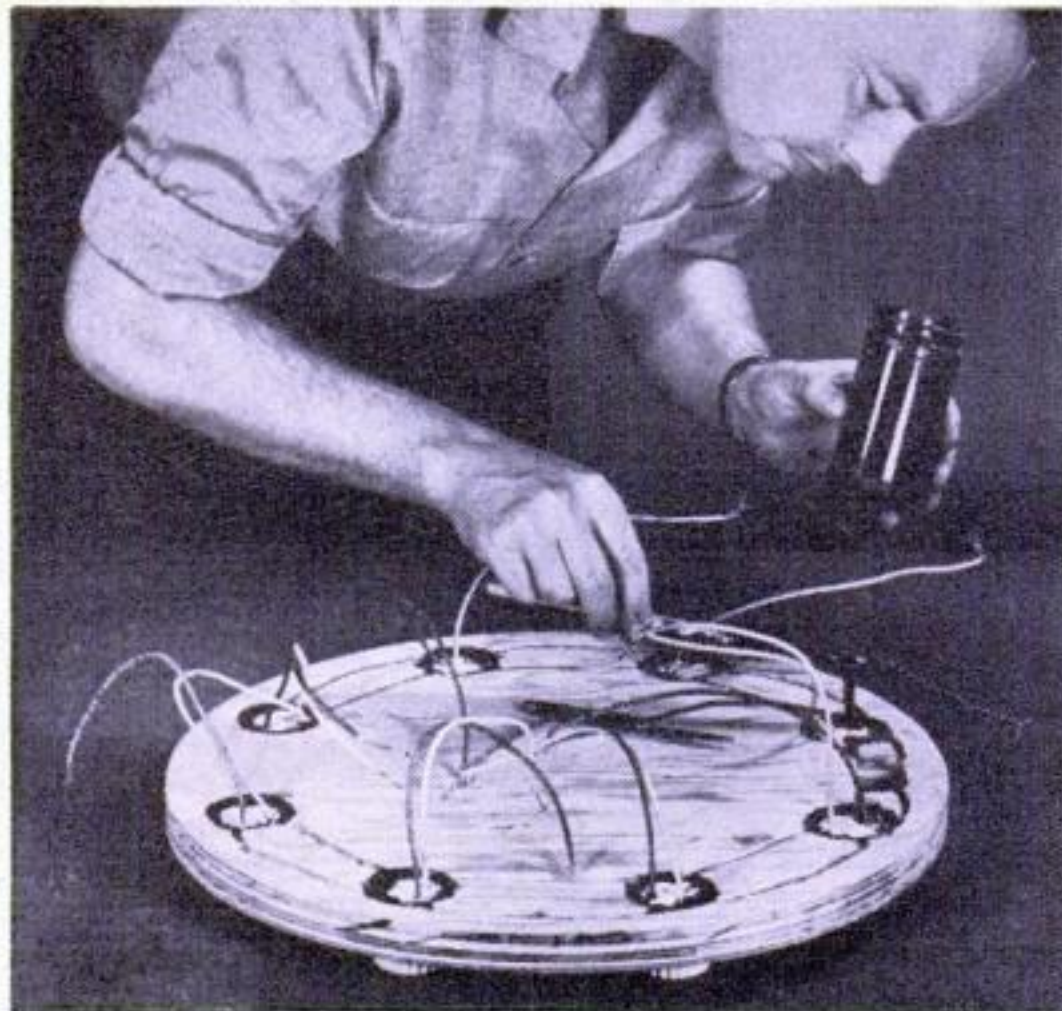
DISK LAYOUT



can load your camera. And you'll have enough light to eliminate worries about unprintable highlights or empty shadows.

The subtle tonal gradations that characterize good high-key photography can be achieved simply by upping the ring's output until the desired balance is reached.

The first ring light. Credit the ring-light idea to a photographer named Fred Peel, who invented it in the early Thirties. The unit he built consisted of a large doughnut-



Holes for eight sockets are jigsawed in a $\frac{3}{8}$ " plywood disk, and the front of the disk is faced with $\frac{1}{8}$ " hardboard. Sockets are installed, attached with glue-and-sawdust mix, and wired. Hardboard facing is glued to the back.

shaped sheet-metal reflector containing 12 500-watt photoflood bulbs. He mounted this contraption on a heavy studio-camera stand and shot through the hole in the middle with a four-by-five Graflex.

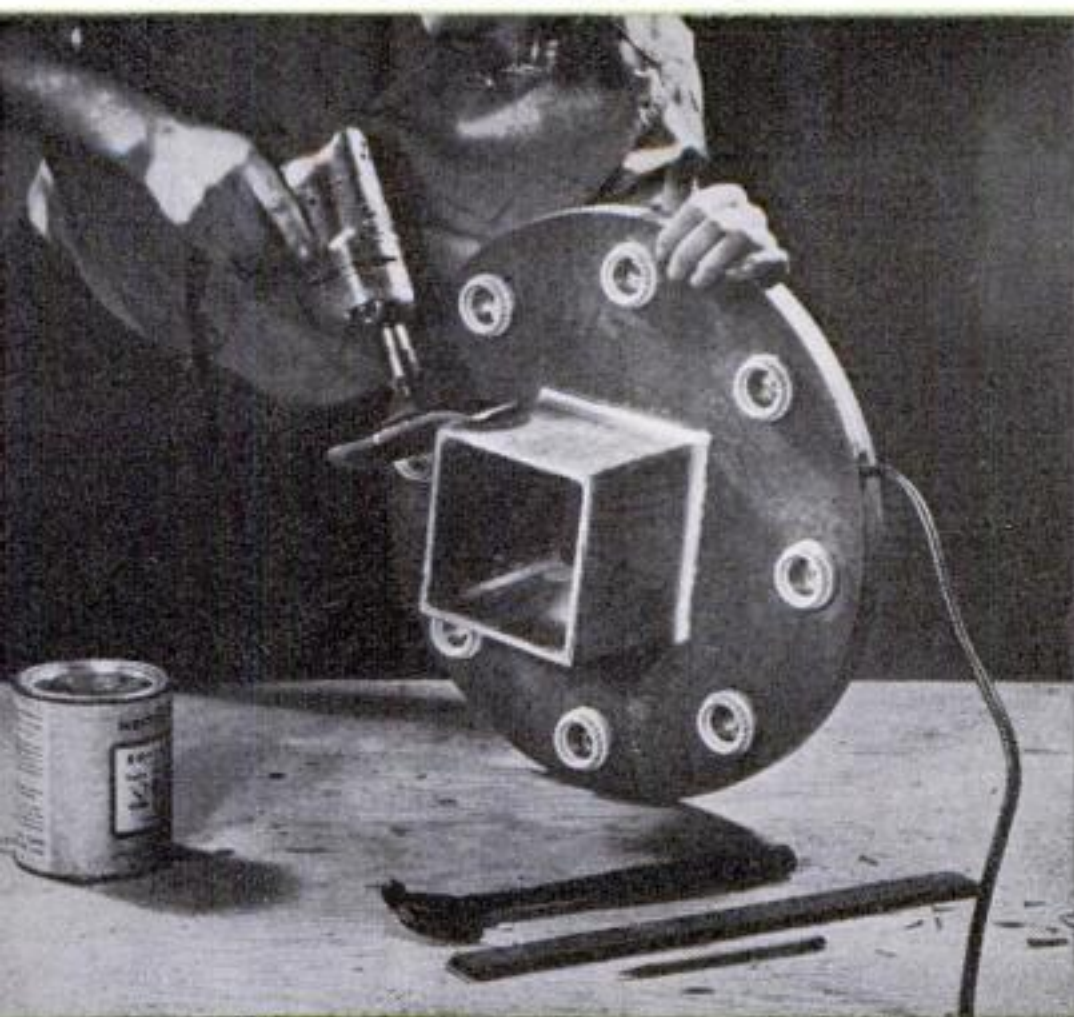
The best of Peel's ring-lighted photographs were shot against white backgrounds that were illuminated separately. Usually, he allowed the background lights to spill onto the subject slightly—just enough to balance the shaded-edge effect that the ring light alone gives.

Peel's work appeared regularly in fashion magazines and the traveling salon exhibitions then popular. Today, variations of the high-key technique he originated are still used.

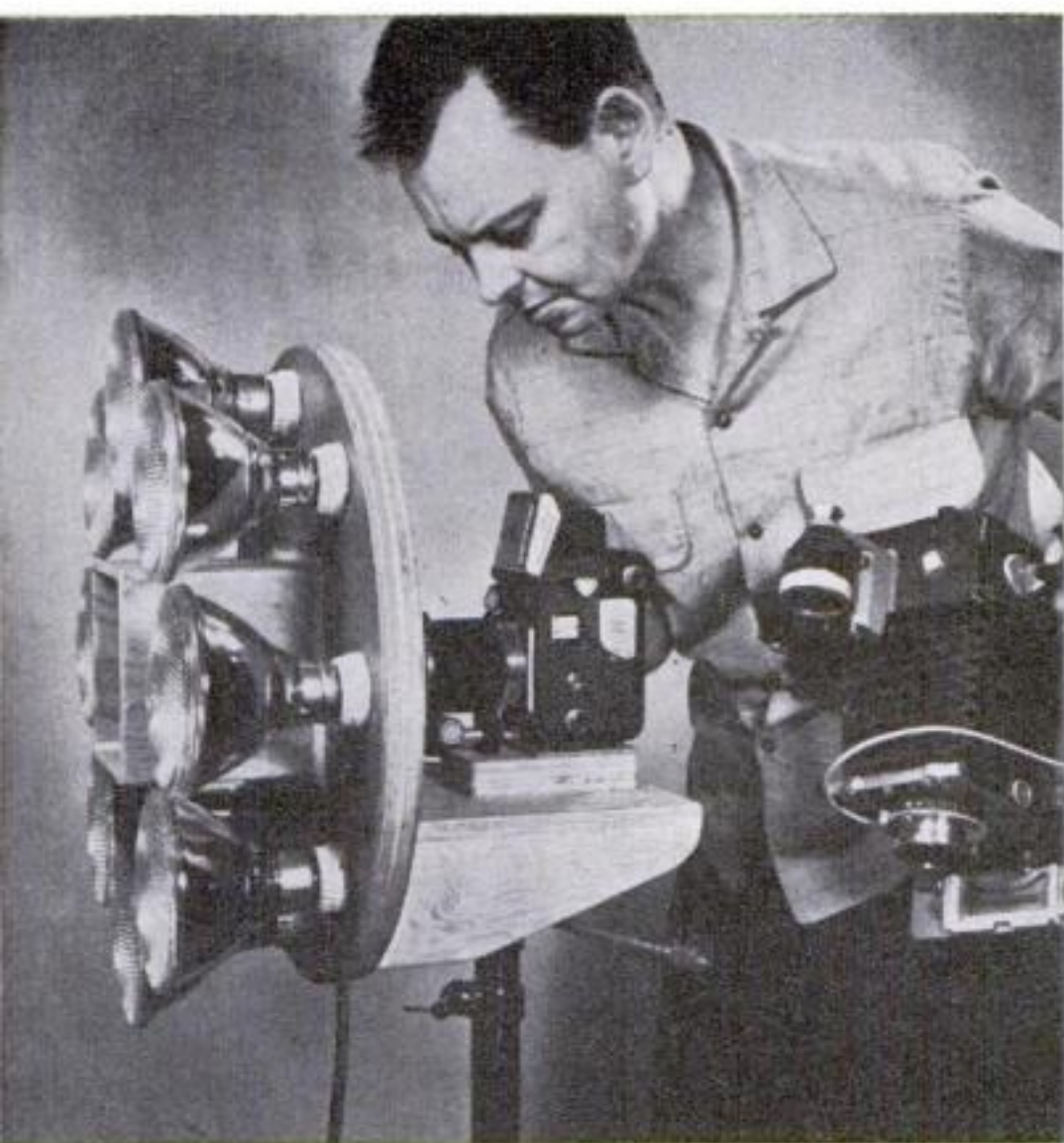
Plan your own ring light for whatever camera equipment you have. Pin-registered plywood blocks center smaller cameras in the opening.

A word of caution in building the ring light: Use heavy wire, preferably at least 12-gauge protected by a 20-amp fuse. You can then use up to 2,000 watts on the circuit. With 14-gauge wire and a 15-amp fuse, the circuit will handle 1,500 watts safely. ■ ■

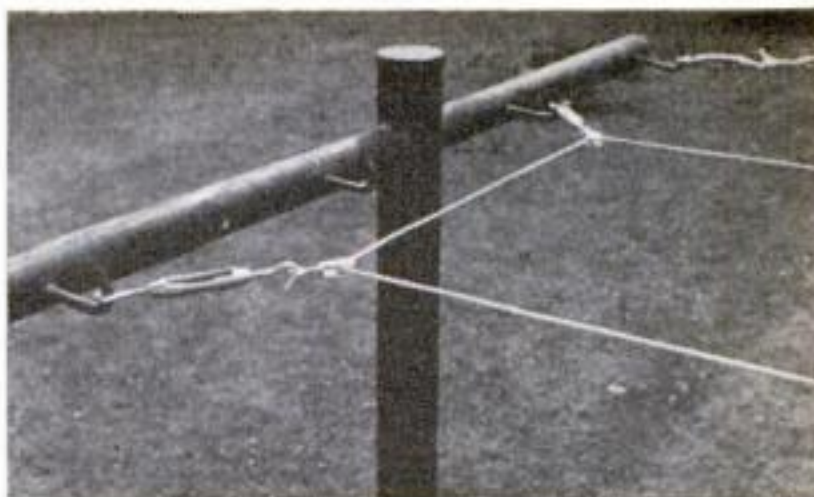
follow these simple steps



Square hole is jigsawed out in the center of the disk. Four pieces of $\frac{1}{4}$ " plywood, mitered and inset flush with back of disk, prevent lens flare. Outside edges are bullnosed, and the inside corners filleted with wood plastic.



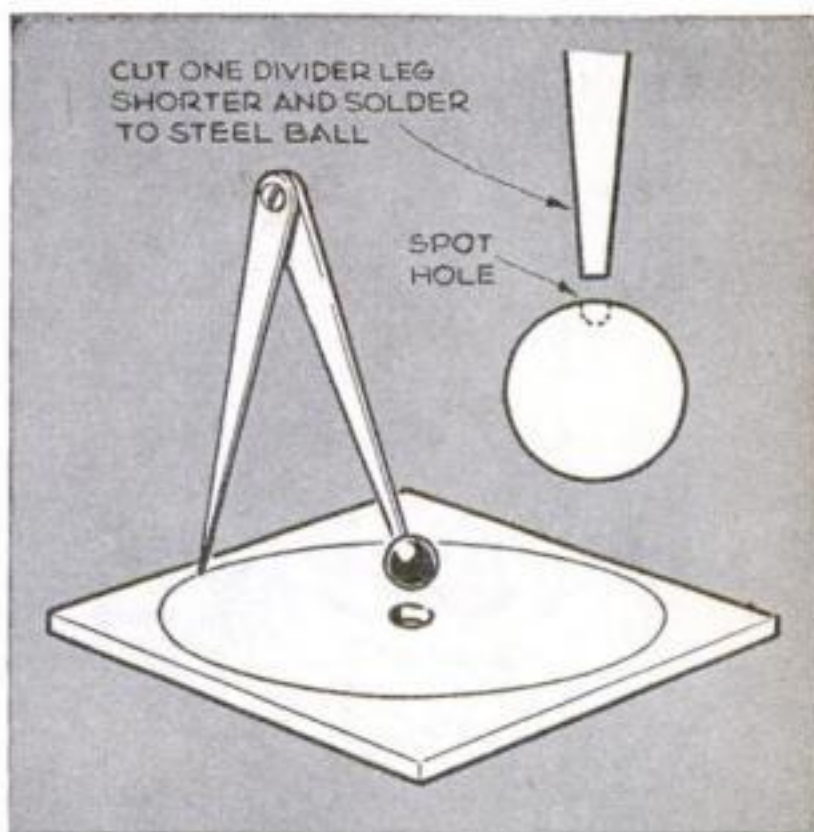
Interchanging the bulbs varies ring light's output. These PAR-38 bulbs throw light a considerable distance. For color, you can use the 250-watt, 3,200-degree K. floods or, for greater output, 3,400-degree reflector photofloods.



Adjustable clothesline rope

Sets of small, rustproof pulleys and turnbuckles, available at your hardware store, keep a clothesline taut even without poles or other median supports. I made our line continuous, passing it through pulleys instead of tying the rope to anchoring hooks. A few twists of the turnbuckles add tension whenever needed.—Ken Murray, Colon, Mich.

►► Sometimes I use a batch of nails that bend easily. When I do bend one while driving it into a board, I simply rap it fairly straight, from the side, without removing it. Then, holding the nail with a pair of pliers, I drive it into place.—A. W. Hanson, Chehalis, Wash.

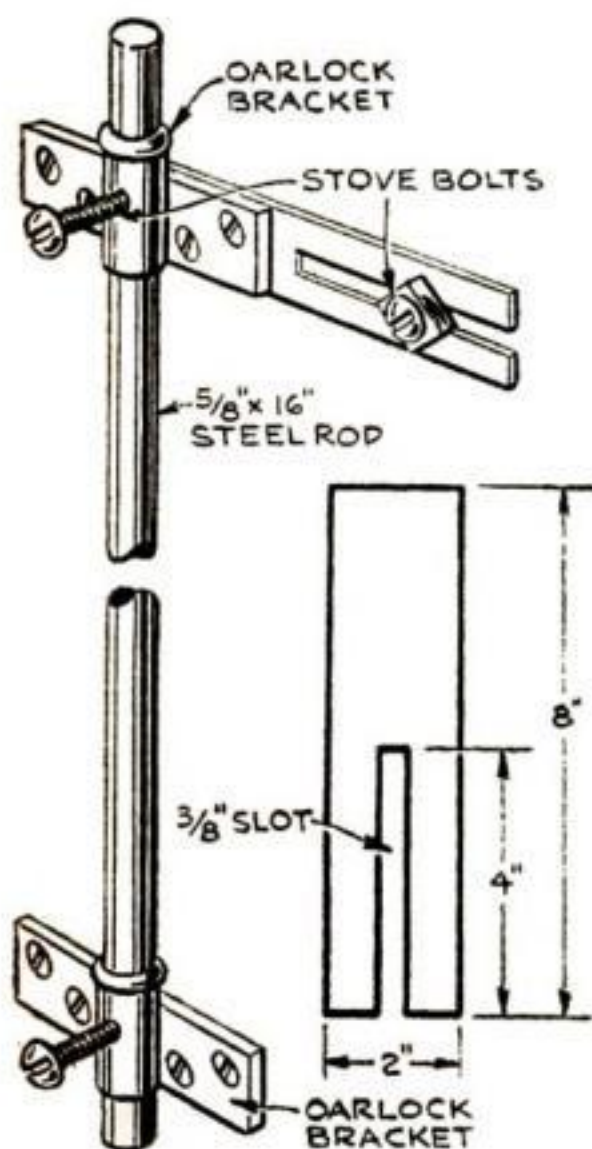


Making use of old dividers

In most toolboxes, there's at least one old divider or inside caliper that will quickly convert to a useful ball divider. This is handy when there's a hole at the center of a workpiece that makes it difficult to scribe a circle at that point. A ball divider easily and accurately solves the problem.—A. T. Pippi, Baltimore, Md.

Short Cuts and Tips

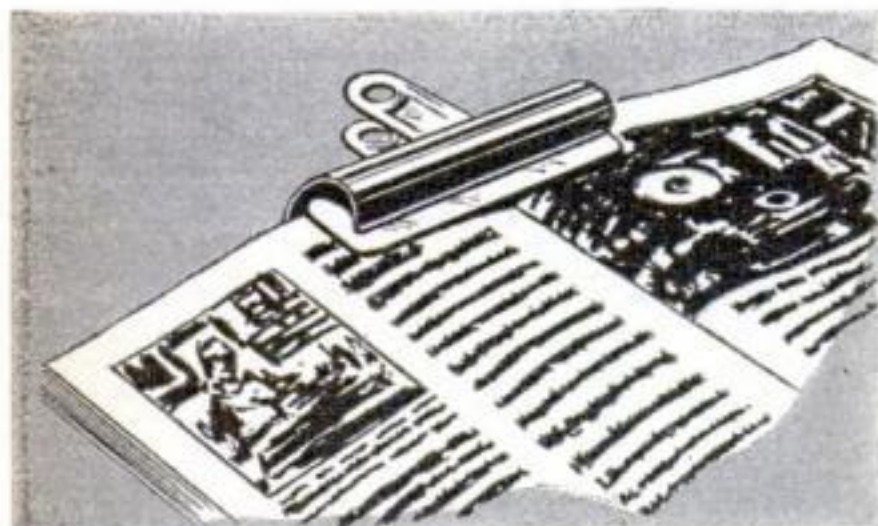
FROM
PS
READERS



Mount for telescope photography

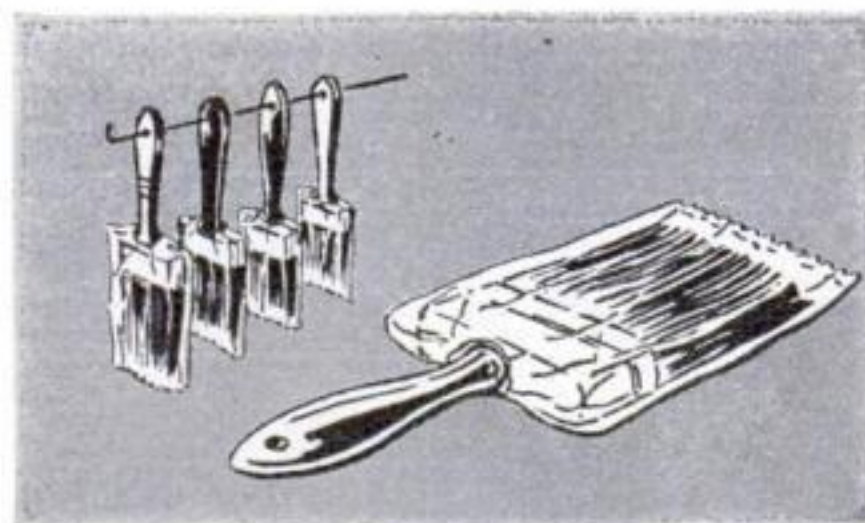
With this adjustable bracket, designed to mount various cameras to my 4 1/4" reflector telescope, I get good shots of either land or sky objects. Materials cost under \$1.50. I tapped the oarlock brackets to take 1/4-20

adjusting screws, bolted one to half a license-plate bracket (or a scrap of 1/4" plywood can be cut as shown) and the other to the telescope tube so it holds the rod parallel to and 2" behind the eyepiece. For safety, I remove the rod when it's not in use.—E. M. Harman, N. Hollywood, Calif.



Big clip is work clamp

One of those large spring clips used in offices is handy in the shop, too. It will hold open a magazine you're working from, hang up a blueprint to give you more bench space, clip together an assortment of sandpaper, and do duty as a clamp on small work.—T. G. Tooker, Alamosa, Colo.



Keeping paintbrushes clean

If you hang up your paintbrushes to store them, they can gather a lot of dust. Plastic shrouds to keep them clean can be made from small food bags. Just cut a hole in the bottom of each bag so the handle of the brush comes through.—Mortimer S. Robinson, New Orleans, La.

what's new

.....TOOLS

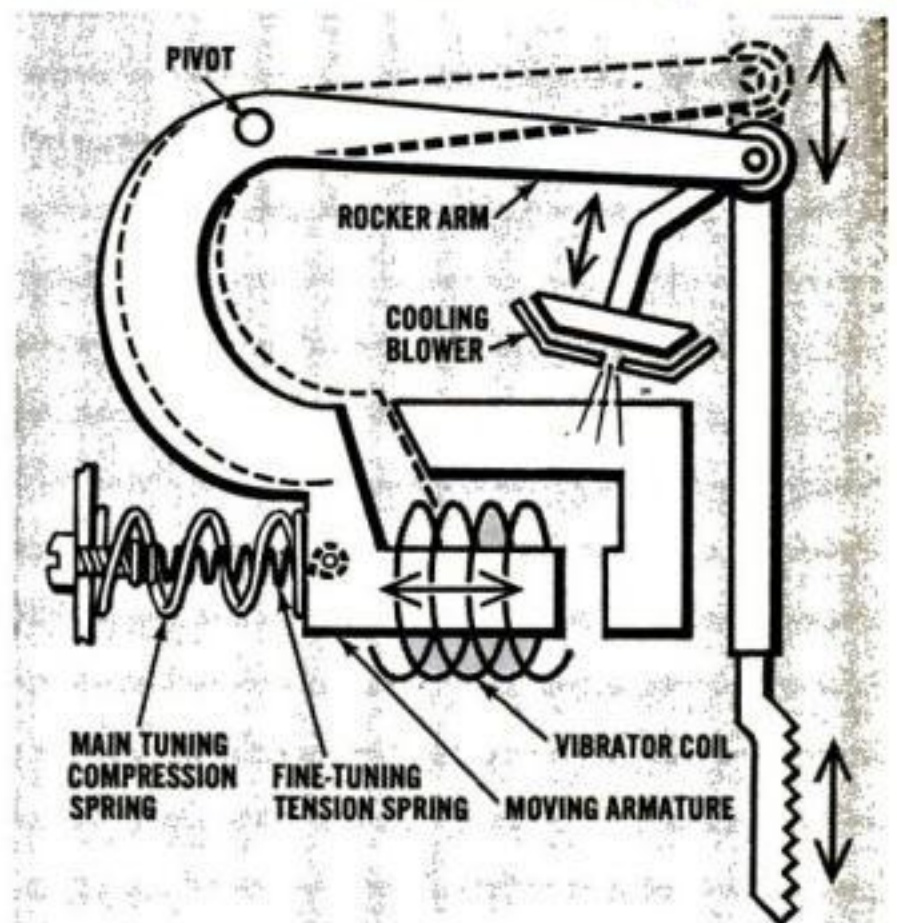


A personal-use report on The New Weller Saber Saw

By Sheldon M. Gallager

FLIP on the switch, and you have to look twice to tell whether the blade is really moving. Its stroke is so short and so fast—like the wings of a hummingbird—that it appears to be standing still.

This is the secret of a new high-speed saber saw just introduced by Weller Electric Corp. The blade travels only $3/16$ ", but it moves up and down 14,400 times

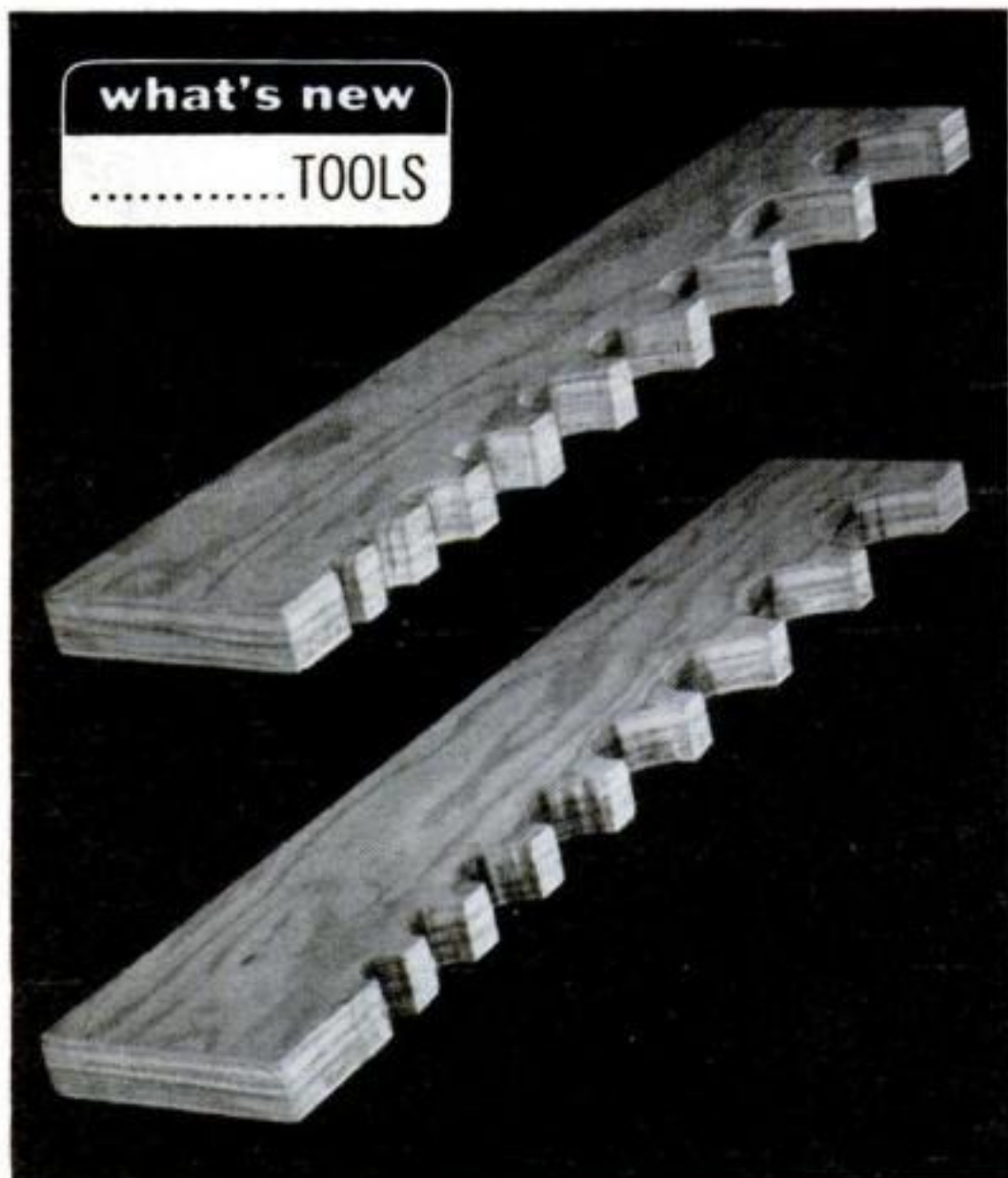


Why it's so fast: The armature inside the vibrator coil moves back and forth 240 times a second, forcing the rocker arm and blade to move up and down at the same rate. Two coil springs, one pushing and the other pulling, enable the vibrator to be precisely tuned like a resonant circuit for maximum power. A cooling blower is also driven by the rocker arm.

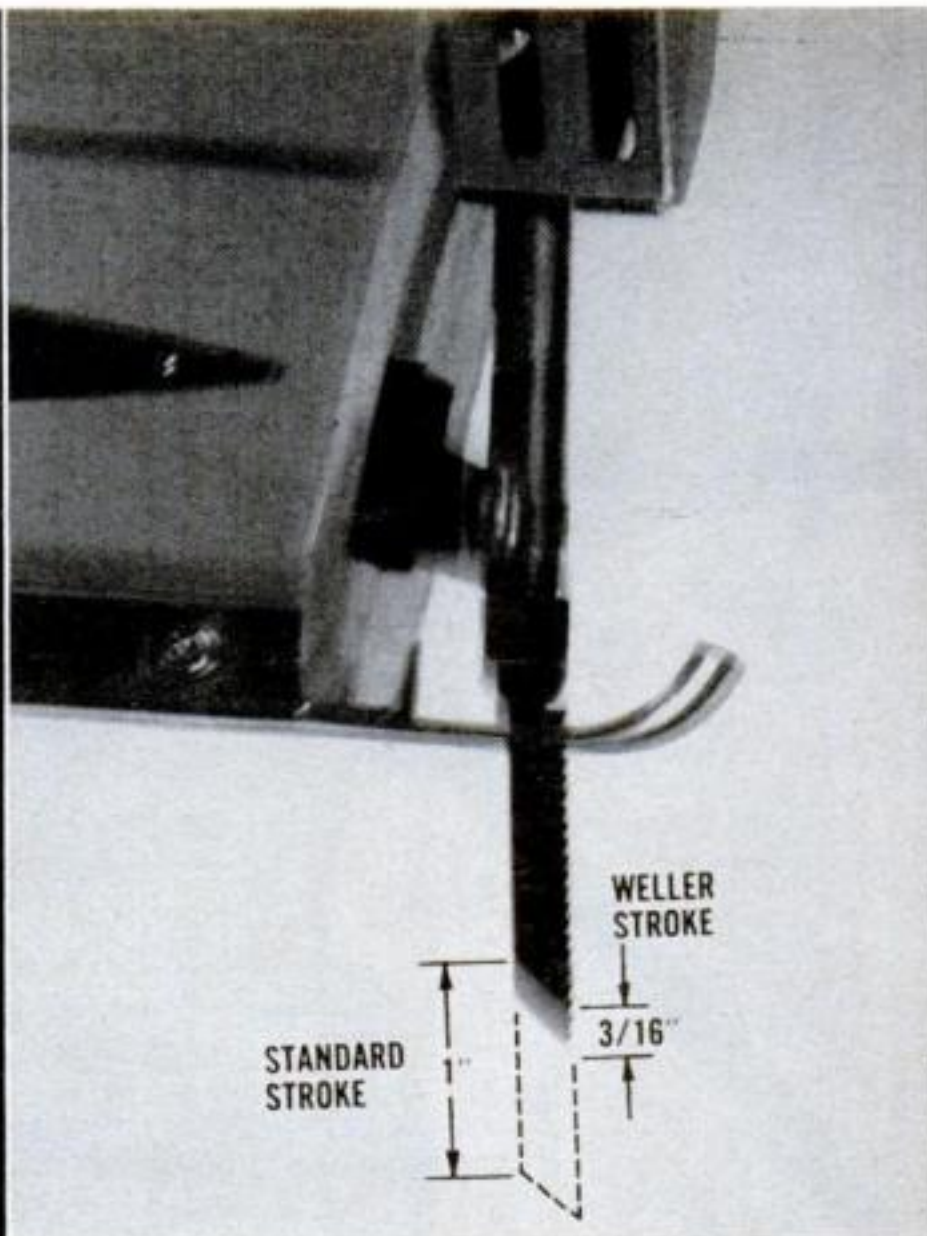
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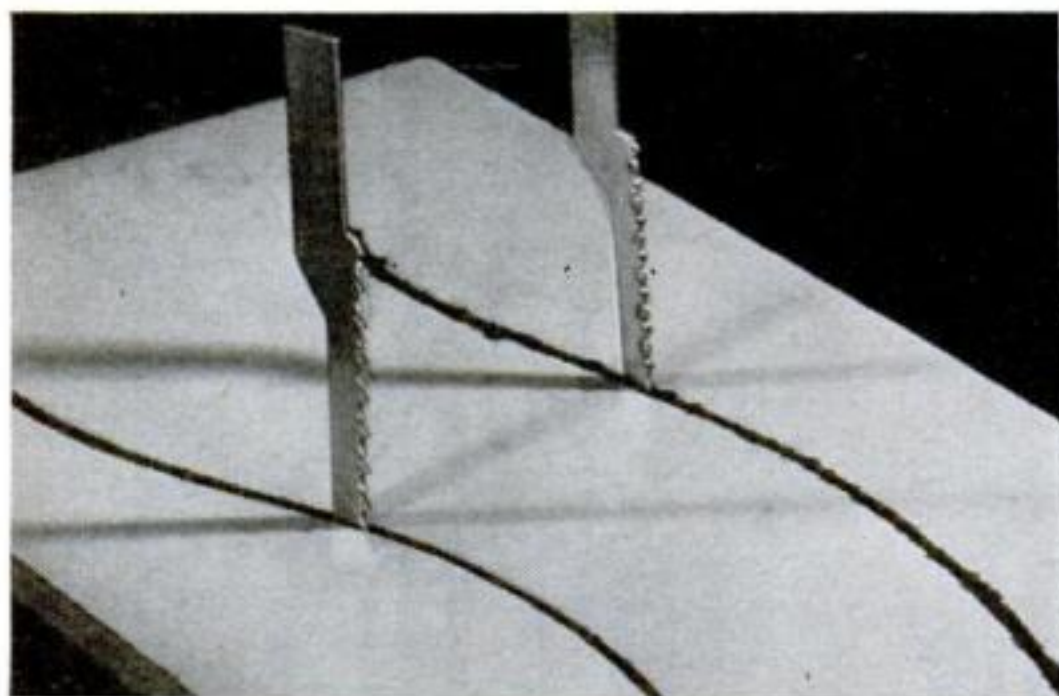
what's new
.....TOOLS



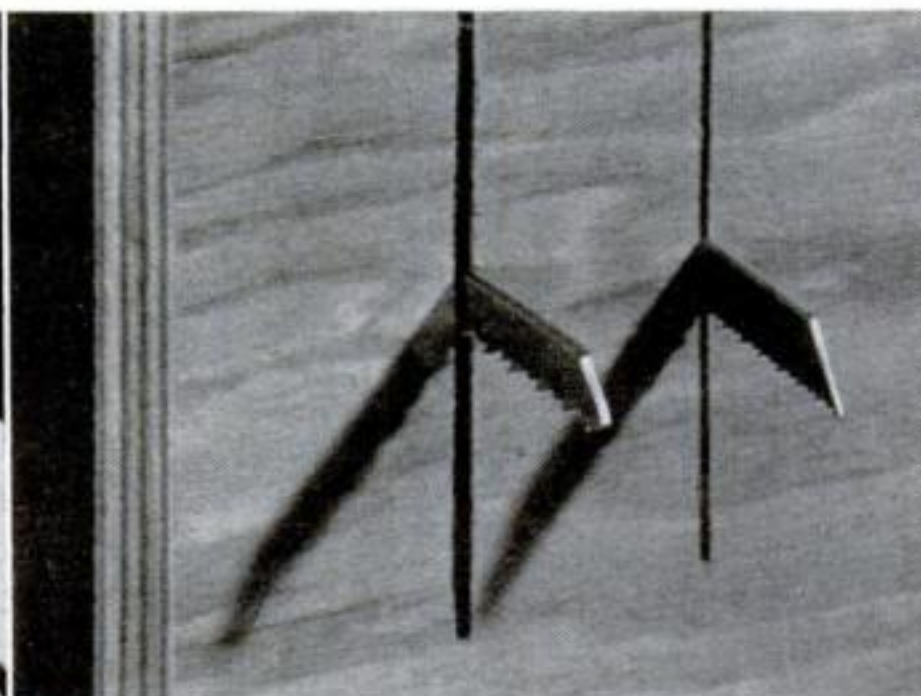
Test curves, made by new saw at top and conventional type at bottom, show ease with which the Weller turns tight corners. Cuts ranged from $1\frac{1}{8}$ " radius down to $\frac{1}{8}$ " radius. Note that conventional saw failed to complete smallest curve, left burns caused by binding.



Secret of smooth cutting is the new saw's short, superfast stroke, almost invisible to the eye. The blade travels only $\frac{3}{16}$ ", compared with about 1" for most standard saber saws.



New downward-cutting blades included with the saw make clean face cuts in delicate materials like this plastic-surfaced hardboard. Note the rough, chipped cut made by a conventional upward-cutting blade at right.



Extra-fine cuts are possible with slim Weller blade at right. Only $\frac{1}{32}$ " thick, it's almost twice as thin as typical standard blade at left.

How the New Vibrator Drive Compares with a Conventional Saber Saw

	CUTTING TIMES PER FOOT						
	In $1\frac{1}{8}$ " Pine	In $\frac{3}{4}$ " Pine	In $\frac{5}{8}$ " Maple	In $\frac{3}{4}$ " Plywood	In $\frac{1}{4}$ " Plywood	In $\frac{3}{8}$ " Hardboard	In $\frac{1}{8}$ " Plastic
NEW WELLER SAW	47 sec.	29 sec.	2½ min.	41 sec.	12 sec.	7 sec.	31 sec.
CONVENTIONAL SAW	30 sec.	15 sec.	56 sec.	34 sec.	16 sec.	10 sec.	40 sec.

a minute. This provides 7,200 actual cutting strokes—120 *every second*.

The principle is the same as that used in the Weller finishing sander. Instead of the motor found in conventional saber saws, a high-speed vibrator supplies power directly to the blade through a simple rocker-arm drive. There's no problem of converting rotary motion to straight-line motion since you already have it to start with. A similar vibrator was used in an earlier saber saw, but was less powerful. The new drive has been beefed up to give a lot more muscle. One tip-off is its power draw—nearly a full five amps under load.

How well does it work? We were familiar with the fine qualities of the Weller sander [see PS, Feb. '62] but the rugged requirements of sawing are another story. We put the saw through its paces and came up with some interesting findings.

It's slower but smoother. To test cutting speed, we deliberately pitted the new Weller saw against one of the more expensive conventional makes in order to give us a high standard of comparison. The results, shown in an accompanying table, reveal a surprising fact: In thick materials, the Weller wasn't quite as fast. But in thin materials, it actually outcut the conventional saw, one of the best on the market.

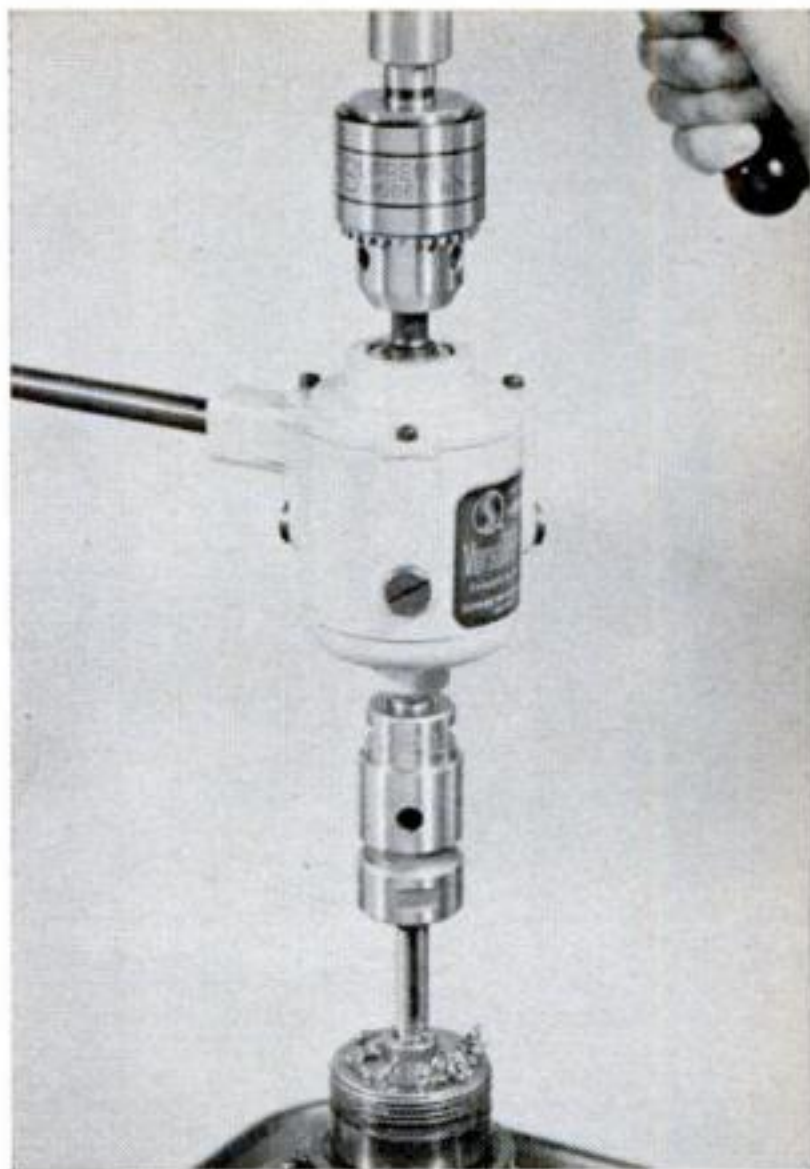
The reason: The short, quick strokes of the Weller have an advantage in thin stock where only a few blade teeth are in contact with the work. In thick stock, the slower but longer conventional stroke has an edge because it covers more ground.

The Weller gives a smoothness of cut, however, that does not show up in speed tests alone. The short, high-speed stroke shears wood fibers cleanly without any of the tearing, splintering, and bucking sometimes encountered with conventional saws.

In $\frac{3}{4}$ " plywood, always a rough test, the Weller has the effortless, gliding feel of a wire knife slicing through cheese. In thin plastic, another problem material, the conventional saw chattered hard enough to produce several cracks and chipouts before completing the cut. The Weller sailed through with no damage to the plastic at all.

The cutting action is so gentle, in fact, that you have to watch out for one curious blind spot. Very thin, flexible materials, unless solidly supported, may start to vibrate right along with the blade. In this

[\[Continued on page 202\]](#)



Drill-press accessory taps holes fast

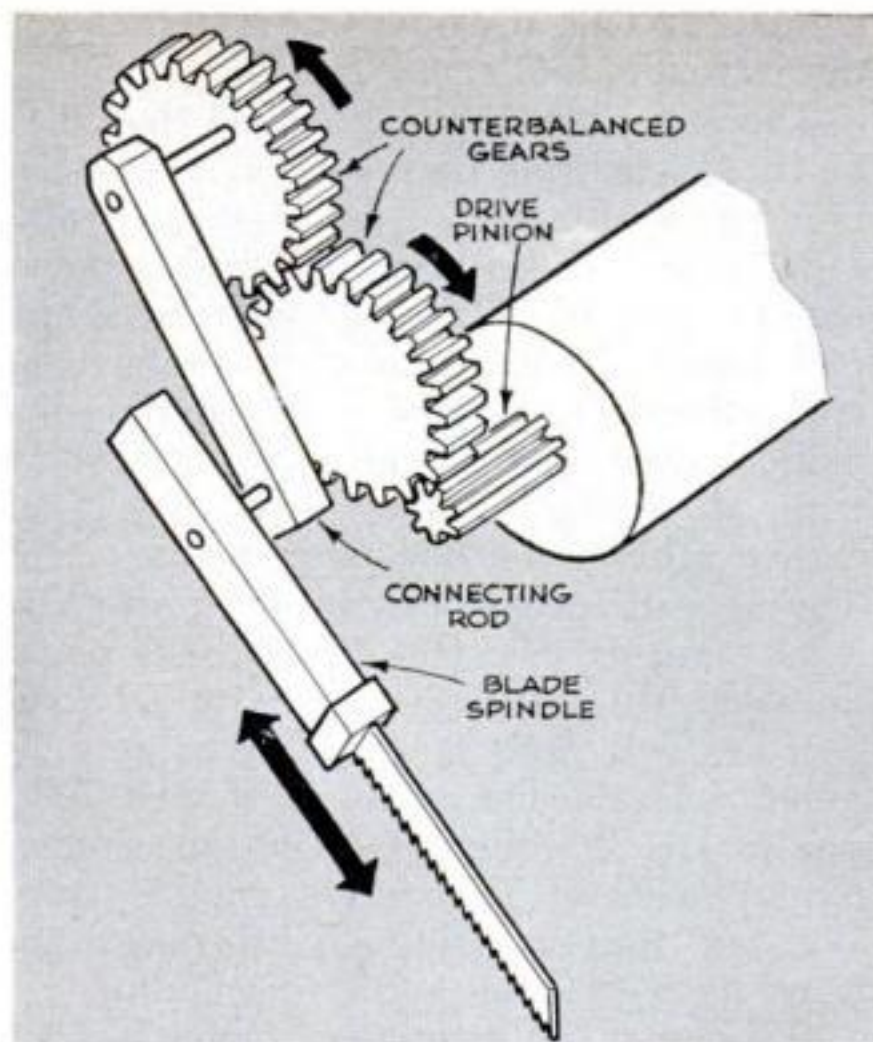
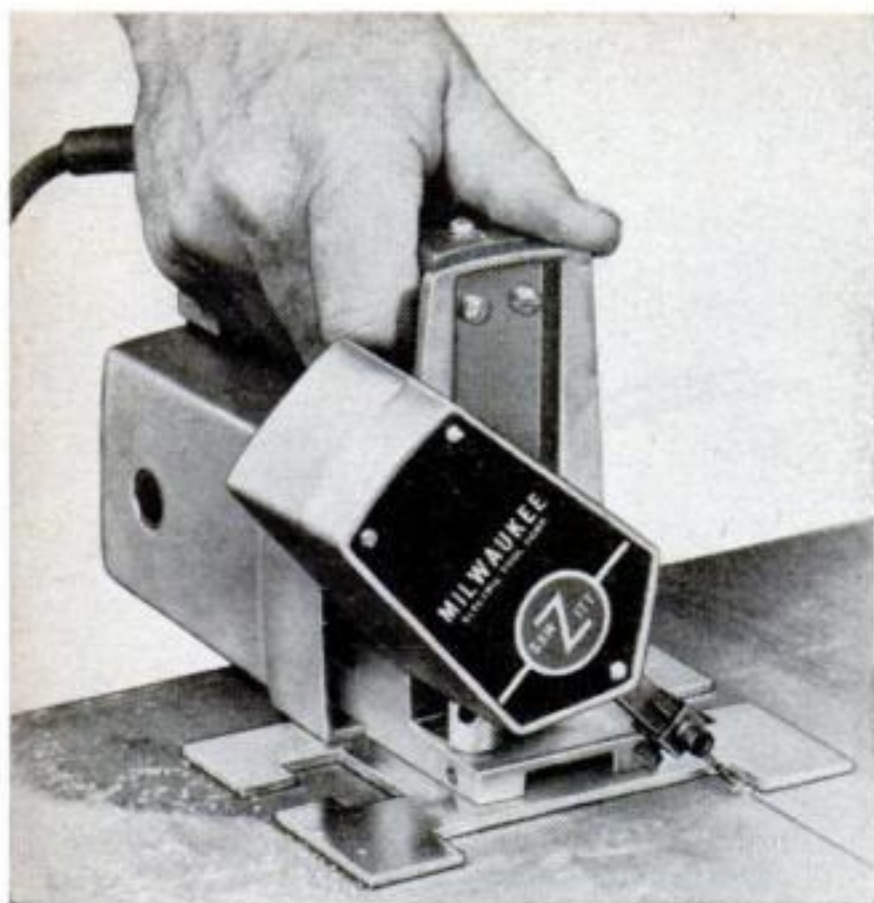
You can tap holes with a drill press using this attachment. It has a 4:1 gear reduction and an ingenious forward-reverse clutch: Press down, and the tap turns forward; let up, and it automatically backs out to clear chips. The Versa-Tapper takes taps up to $\frac{3}{8}$ " and comes in three models for chucks and taper spindles. Price: \$63, Supreme Products, 2222 S. Calumet Ave., Chicago.



Tiny drill for big jobs

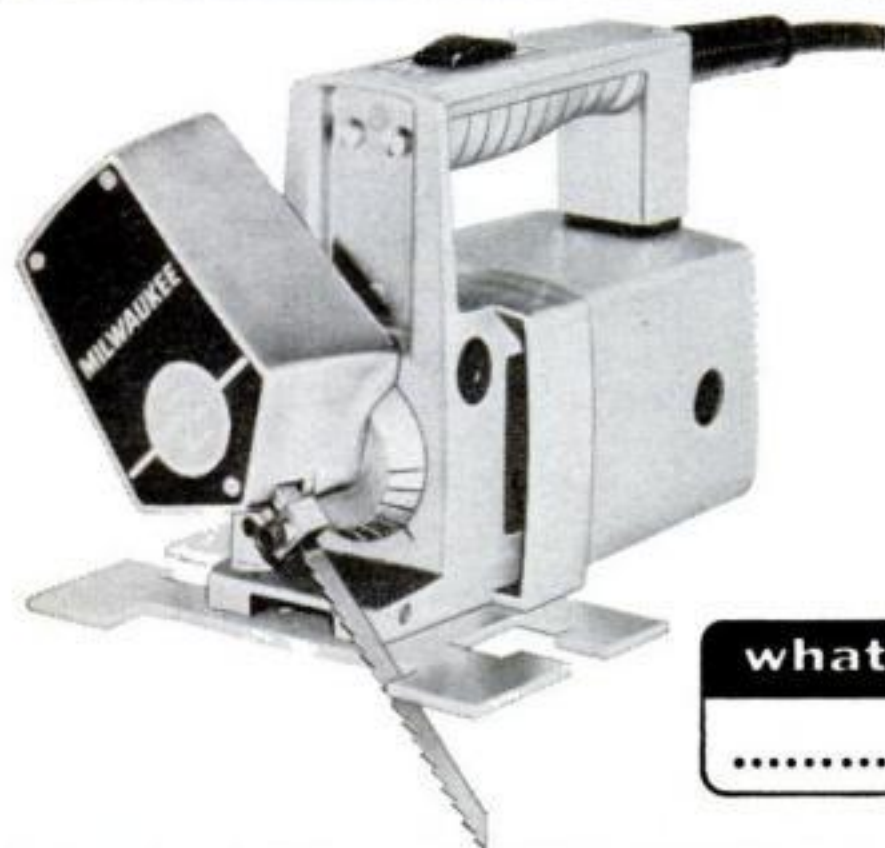
This palm-size $\frac{1}{4}$ -incher is 6 $\frac{1}{2}$ " long, weighs only 27 ounces. The secret: A permanent-magnet stator cuts motor size and a tiny transistor converts AC to DC to boost power. Price: \$32.50, Thor Power Tool Co., Aurora, Ill.

For more new tools, turn the page



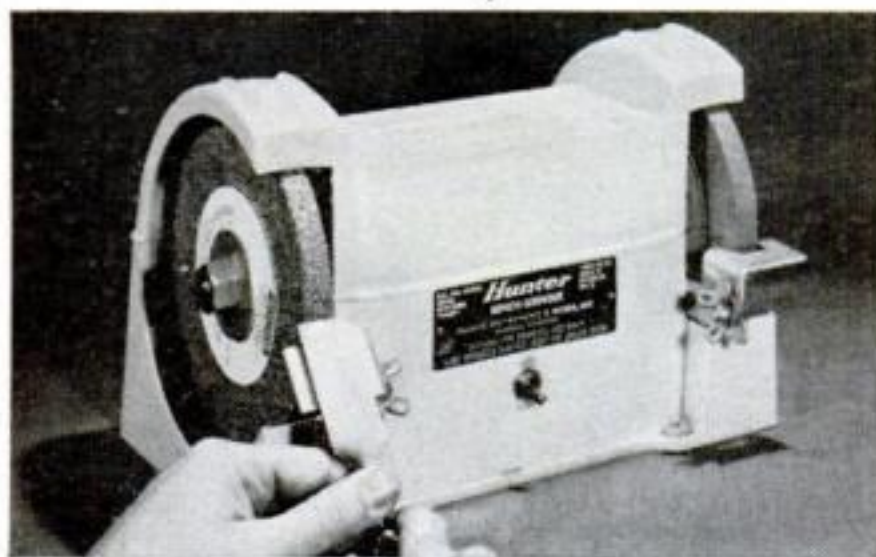
Pivot-head saber saw for angle cuts

Something's been added to the portable jigsaw. The Sawzitt, made by Milwaukee Electric Tool Corp., will do all the usual saber-saw jobs, but also has a head that tilts right or left up to 45 degrees for bevel cuts. Sketch above shows how: Gears within head pivot around motor shaft, which drives them in any position. One end of the connecting rod is pinned to the top gear; other end moves the blade up and down. Price is \$69.50.



what's new

.....TOOLS



Two-grit grinder for home workshops

Powered by a heavy-duty ¼-hp. capacitor motor, this grinder has a 6" wheel at each end—80-grit on left, 46-grit on right. Tool-rests are adjustable. The die-cast aluminum housing rides on rubber feet, for use anywhere. It's \$25.95, postpaid, from Hunter Division, Robbins & Myers, Inc., 2500 Frisco Ave., Memphis, Tenn.



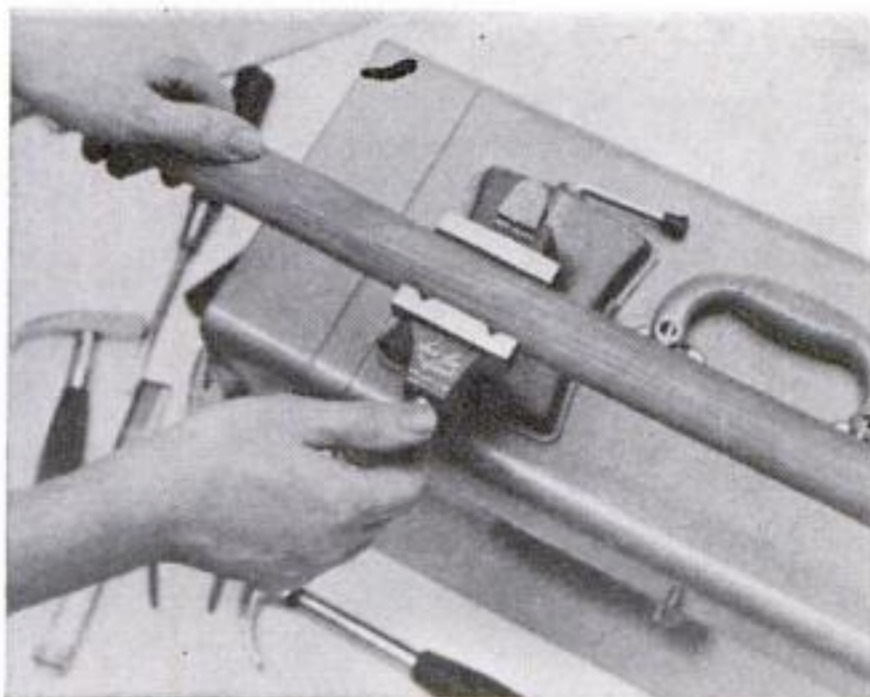
Drill drives metal-cutting nibbler

You can use your electric drill to cut sheet metal with this attachment. The punch-type nibbler handles steel up to 18 gauge and other thin materials such as laminates. Two types of punches allow it to cut straight ahead, or sideways to follow corrugations. The Nibbllex sells for \$30 from Hedstrom Tool Co., Box 319, Montclair, N.J.



Two-headed horizontal nail set

This nail set has a point on both ends. They're set at an angle to the shaft, for safe, easy holding. The sizes— $2/32''$ and $3/32''$ —handle all commonly used nails. It's the No. 233 Offset Nail Set, made by Millers Falls to sell for 99 cents.



Portable vise for your toolbox

The Vacu-Vise, made by General Slicing Machine Co., Walden, N.Y., weighs only $4\frac{1}{2}$ pounds and anchors—by vacuum power—to any smooth surface. The $2\frac{1}{2}''$ V-groove jaws hold any material up to 2" thick—right at the site, indoors or out. Cost: \$6.95.

►►►Need a miniature socket wrench for delicate model or electronic work? A set of five sizes for hex nuts from $5/64''$ to $5/32''$ is available from Moody Machine Products Co., Culver and Willard Sts., Providence, R.I. The sockets fit in a tiny swivel handle and sell for \$3.95. They also come with a nonmetallic handle for \$3.50.

what's newCAMPING



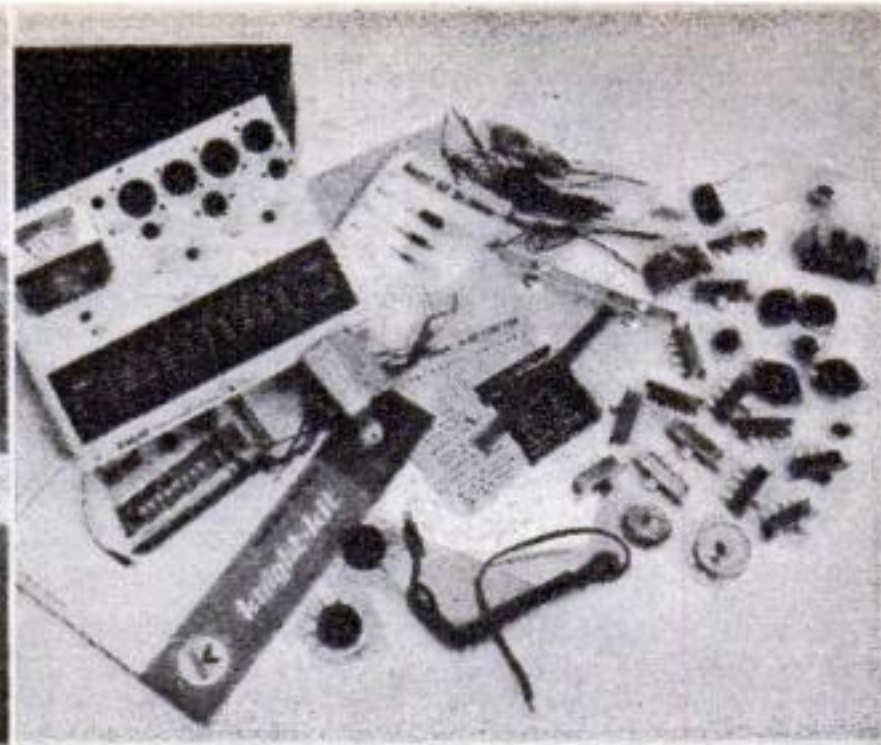
Camp heater uses propane gas

Latest in propane appliances is a radiant heater designed for rugged outdoor or emergency use. With no open flame, it's safe in a wind. Bernz-O-Matic prices it at under \$30 with two disposable cylinders, enough for 24 hours.



Outdoor cooking kit in a roll

With heavy-gauge aluminum foil and wire, you can make your own pots and frying pans when ready to cook, then bury them instead of washing and lugging them back home. Form the wire around a post or log end, fit in foil, and you're all set—or you can make utensils on a forked stick. Donlee Metal Products Co., 14 Carner Ave., Rutherford, N.J., sells the kit for \$1.10.



A \$19.95 tube tester

what's new ...ELECTRONICS

LIKE to be able to test your own tubes right on the spot? For about \$20—the price of a new tester in kit form—you can check all tubes commonly used in radio, TV, and hi-fi equipment. Since 90 percent of all troubles are tube failures, owning your own tester makes good sense.

The instrument, unlike some other inexpensive ones on the market, is a true emission-type tester, enabling you to check tube strength as well as filament continuity and shorts. Seven sockets take all standard-base tubes. One particularly nice touch is a flip-card tube chart on a slide-out tray that makes it easy to find switch settings quickly for any tube. Another: All wires are precut, prestripped, and color-coded

for quick identification of their lengths.

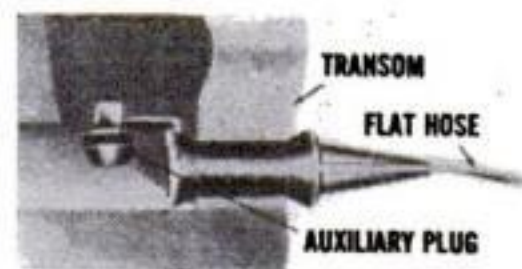
Assembly time is about eight hours—an easy weekend job. Because the tester is basically a switching network, there are few tiny or delicate parts to fuss with. Soldering goes fast. At only one point does the wiring get a bit tight—where one tube socket is close to the chassis.

To check out the instrument, tests were run on all types of tubes, comparing known good ones against known bad ones. In all cases, the tester performed perfectly. In some cases, it even fingered weak tubes that were thought to be functioning adequately. Our opinion, in short: The Knight-Kit Model 400A checker is a honey of a buy.—*Sheldon M. Gallager.*

what's newBOATING

EVER swamp your boat because you forgot to replace the plug after draining the bilge? You can't if you install the Phif-f-f—an automatic plug (right) that fits all standard drain holes. The rocking action of the boat lets water pass out through the

hose, but water pressure keeps the lips sealed against back-flow. \$3.25 from Tempo Products Co., 2062 E. 70 Street, Cleveland.



The same company offers a rugged bracket that balances an outboard motor in a tilted position for storage or shallow water, reducing the strain on the transom. The Tiltlok comes in six models, to fit all recent motors, priced at from \$2 to \$2.50.



A \$19.95 multiplex adapter

New Electronic Kits

PS staff members who have assembled them

TEN hours of fun assembling a \$20 kit converted my FM tuner for stereo-multiplex reception. Although operating in a near-fringe area with a nondirectional antenna, it gives surprisingly good results.

The adapter kit (Knight-Kit Model KS-10A) is easily assembled by anyone who has handled a soldering iron. The parts layout is open enough to present no difficulties even to the beginner. Complete instructions are given for connecting the adapter to any FM tuner, even those not equipped with multiplex output jacks.

The only critical adjustment is tuning

Both kits are available from Allied Radio Corp., 100 N. Western Ave., Chicago.

the oscillator-coil slug. The separator control on the adapter is turned fully counterclockwise, a stereo station is tuned in, and the oscillator slug is adjusted for the clearest signal with a tool supplied in the kit. The control is then turned clockwise for good separation between the right and left channels.

You get an extra bonus: After the oscillator slug is adjusted, the separator control acts as a stereo-broadcast finder. In its counterclockwise position, only stereo transmissions are received clearly. Tuning the FM set spots actual stereo broadcasts. After a station is found, a half turn of the separator control brings in both channels.—*Harry Samuels.*

Fuel consumption of any marine engine has always been guesswork because so many variables affect it. Now you can connect a flow meter to your fuel line to measure every drop your engine burns. The dash-mounted Cruise Master, made by Ongaro Dynamic Industries, Columbus, Ohio, to sell for around \$55, gives you a continuous reading in gallons-per-hour and lets you determine the throttle setting for maximum speed at minimum consumption.

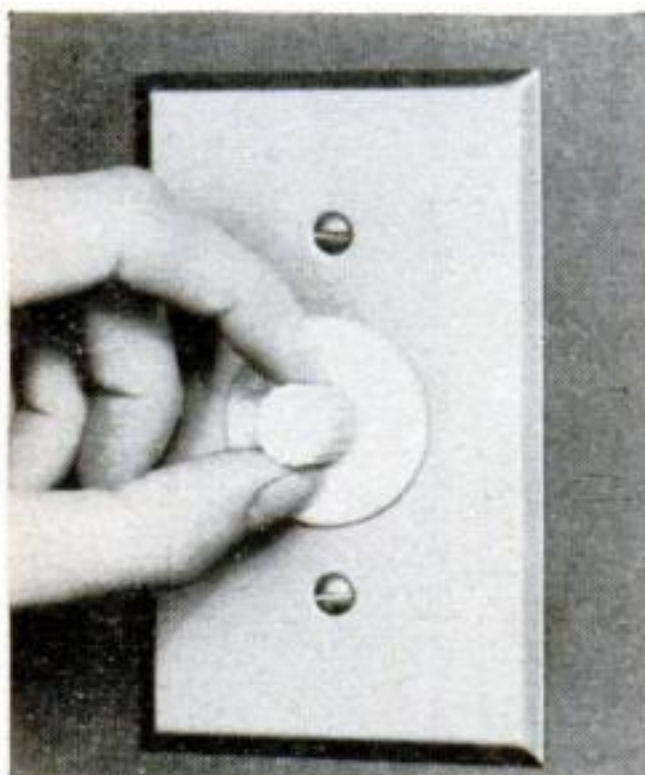
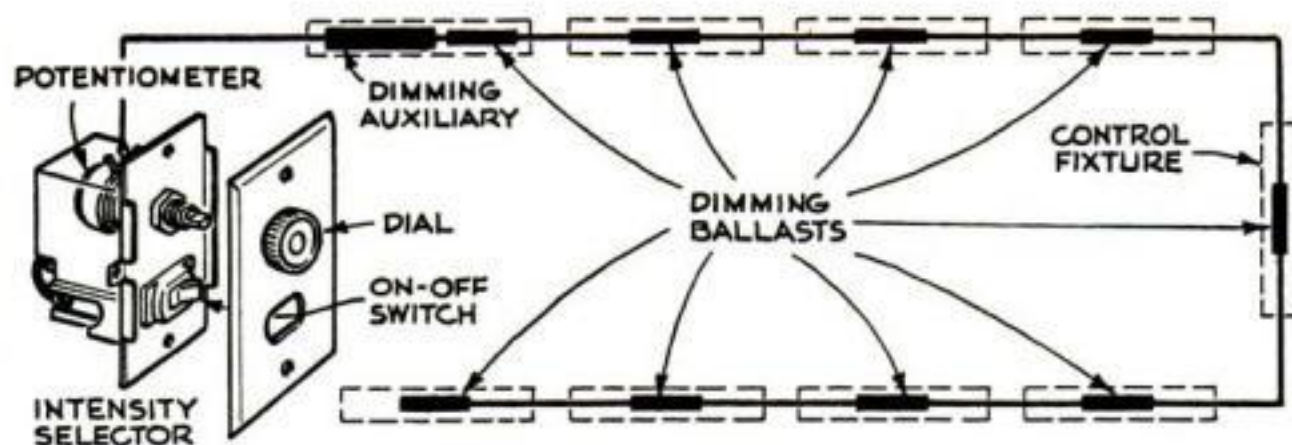
The seven-foot Sportyak II (right) is a very maneuverable rowboat molded of high-

density polyethylene. It weighs 35 pounds, holds two, sells for \$90 at sporting-goods stores. The optional outboard mount is \$13.



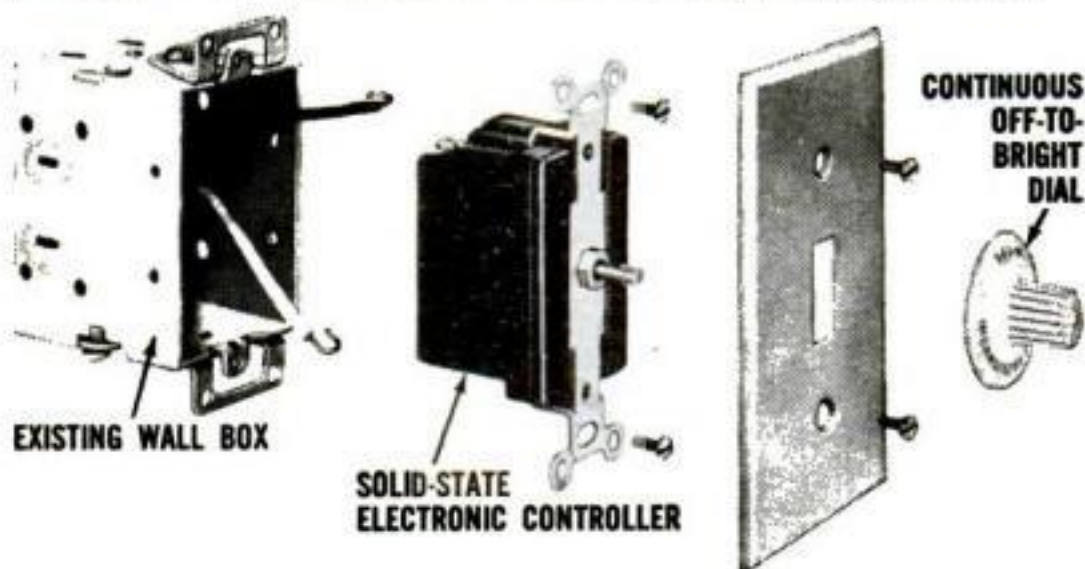
what's new

.....HOME IMPROVEMENTS



Fluorescent strip lighting in a cove around a room can be controlled from a single wall dial. For up to nine tubes, you just connect fixtures containing a special ballast to a master fixture that has an SCR auxiliary as well. Ballasts include a filter to reduce radio or TV interference, and can be used to replace nondimming types in standard fixtures.

Incandescent dimmer slips into standard wall box. Just detach wires from old on-off switch, attach to SCR unit. This one's made by Superior Electric Co., Bristol, Conn.



Dial Dimmers Replace Switches

FRIENDS are over for the evening. You flood the room with light for the bridge game. Afterward, during refreshments, you step to the wall switch and lower the lights for more restful illumination. When someone suggests a favorite TV program, you dim the lights still further.

You can now install such lighting controls inexpensively in your home—without extra wiring or redecorating. The old single-pole types simply added another toggle position to a standard on-off switch to give

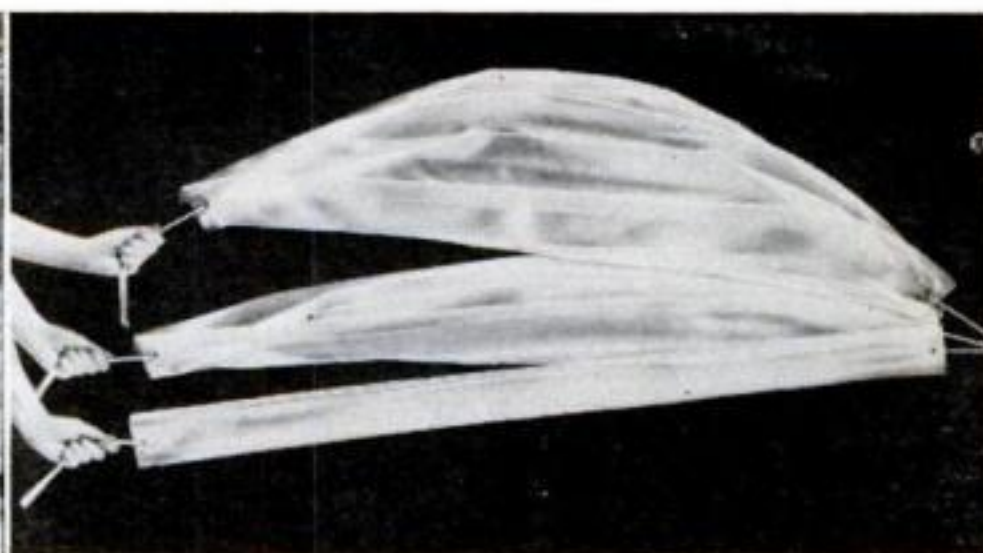
you one half-light setting. They were suitable only for incandescent lamps. New dimmers let you dial the precise light level you want, in a continuous brightening or fading of either incandescent or fluorescent lamps—though not intermixed.

The secret of dial dimming is the silicon-controlled rectifier (SCR) developed for the missile program. This solid-state resistor (no tubes, moving parts, or complicated circuits) is so compact that, in the fluorescent system, the dimmer auxiliary goes right into the fixture. Previous fluorescent dimmers were so big they had to be mounted inside the wall or tucked into a closet. Now, the only control that goes in the wall is the intensity selector (potentiometer)—and it fits into an existing wall box.

These systems start around \$70. For this you get both the switch and a master SCR fixture. Ballasts for additional fixtures run about \$16.

The incandescent system is simpler and cheaper. Here the SCR itself is set in the wall box, and controls voltage fed to standard ceiling fixtures or lamps. These dimmers cost \$20-\$30 for 500-watt capacity, around \$40 for 800-watt.

Manufacturers who offer both systems include: Thomas Industries, 207 E. Broadway, Louisville, Ky., and John C. Virden Co., 6103 Longfellow Ave., Cleveland. GE makes the components for the fluorescent dimmers.



Plastic cover folds itself

Storing lawn or patio furniture this winter? Plastic covers will protect the pieces. This one snaps closed, when not in use, like a woman's rain bonnet. It's made

in three sizes: 84" by 84" and 72" by 105" for \$3.98, and a 10'-by-16' whopper that sells for \$7.98. Instant-Fold Products, Inc., 16 E. 42nd St., NYC, designed it for indoor and outdoor covering of everything from a bicycle to a boat or small car.



Home heat sealer cuts down KP

Sealing foods in boilproof pouches for home freezing is easy with a new appliance. After filling the Scotchpak pouch with precooked food—soup, stew, left-over vegetables—you insert the mouth of the bag in the sealer, press a lever, and it's airtight. To reheat, drop the bag in boiling water. Sportsman can pack uncooked game in the bags for freezing. There's no pot to clean. Kapak Industries, St. Paul, Minn., sells the electric sealer with a supply of pouches, labels, and measuring cup for \$24.95.

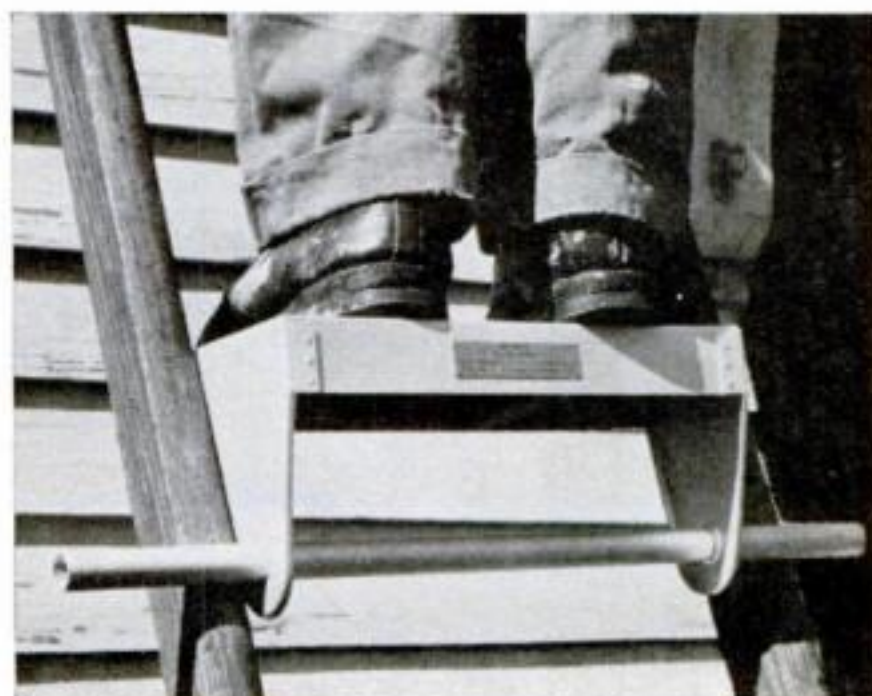


Nonsticking paint tray

This tray, easiest yet to clean, is made of a tough plastic to which paint won't adhere when it dries. It has a built-in brush holder and a wire stand you can lock on a stepladder. Pittsburgh Plate Glass dealers sell the set for about \$2.

Ladder platform is toolbox

Dump your tools out of the box at right, hook it on the rung of a ladder, and you have a 6"-by-12" step on which you can stand for long periods without tiring. A long handle braces it against the side rails. Price, \$4.95, by Tote-Step Corp., 930 N. Plankinton Ave., Milwaukee, Wis.



what's new

..PHOTOGRAPHY

Plastic shell makes movie camera a skindiver

For underwater enthusiasts, a compact Plexiglas housing is available for the Nikkorex 8 movie camera. Inside this housing, the automatic camera makes underwater photography easy for you. An electric motor drives the film, and an electric eye sets the exposure. Focusing is preset from three feet to infinity. A spring-loaded lever operates the release. Camera is priced at \$149.90; housing alone sells for \$69.95.



Close-up attachment for 35mm cameras

Close-up lens and focusing device for 35mm cameras using normal focal-length lenses lets you work as close as 12 inches to the subject. The Contameter fits standard shoe on top of the camera. Parallax-corrected at 12 and 20 inches, the range finder is of the coincident type. Using this unit, a camera may be hand-held for all close-ups except time exposures. The Carl Zeiss combination, with leather case, retails for \$35.

what's new

.....for your CAR



Spring-loaded anchor holds down trunk lid

Can't close the trunk lid because of a bulky load? Keep the lid secure with this anchor. The device consists of two hooks, a spring, and a length of chain. It is also useful for tying down cargo and for light towing. H & R Enterprises, 18309 Schenely Ave., Cleveland, sells the device for \$1.



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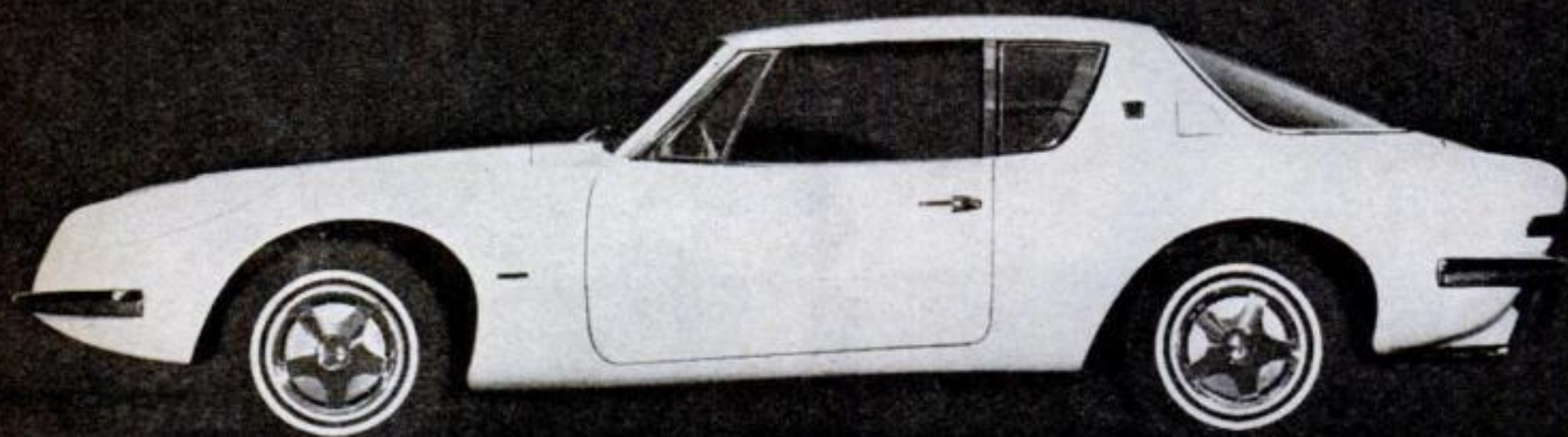
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Studebaker's dramatic new Avanti comes equipped with silvery-plated Champions

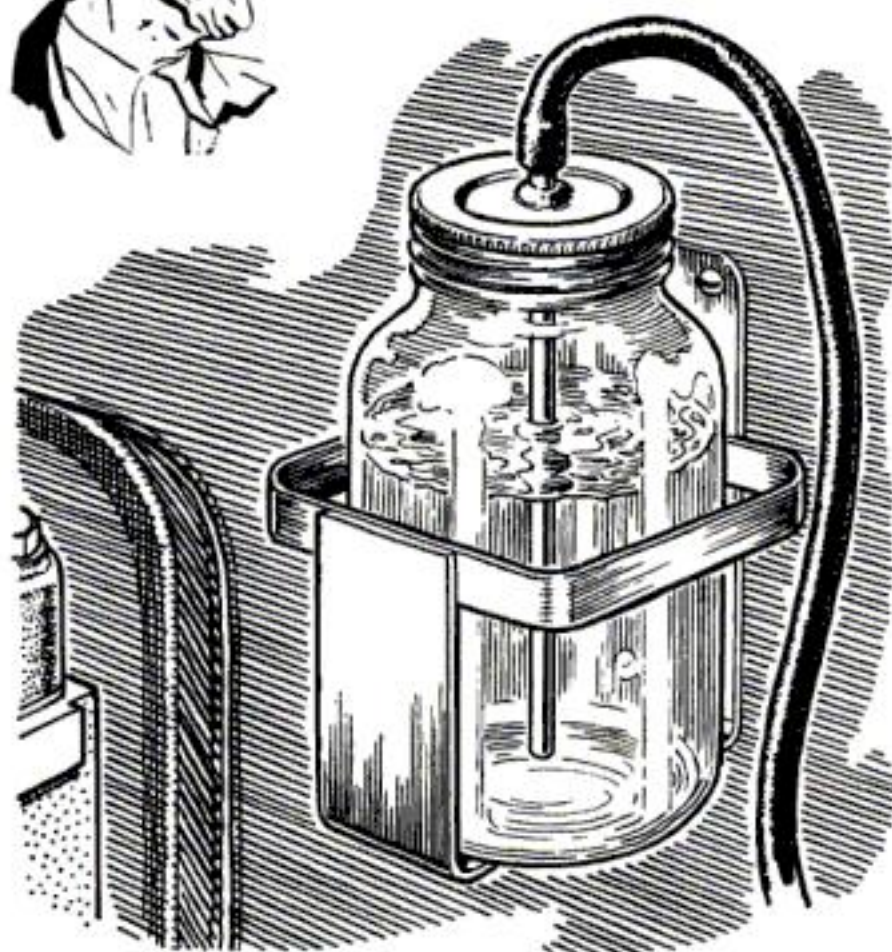
Twice as many of the world's car manufacturers, including Studebaker, specify Champion spark plugs because Champions have no equal for quality and performance. Why settle for less in your car?



CHAMPION



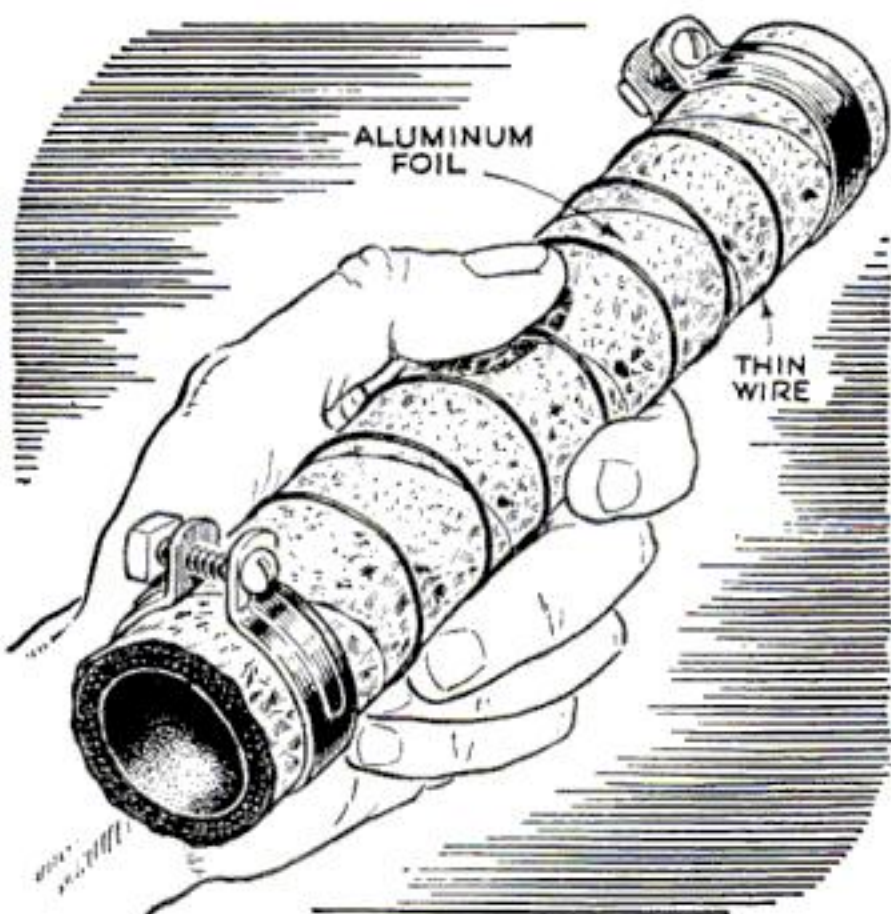
Hints from the Model Garage



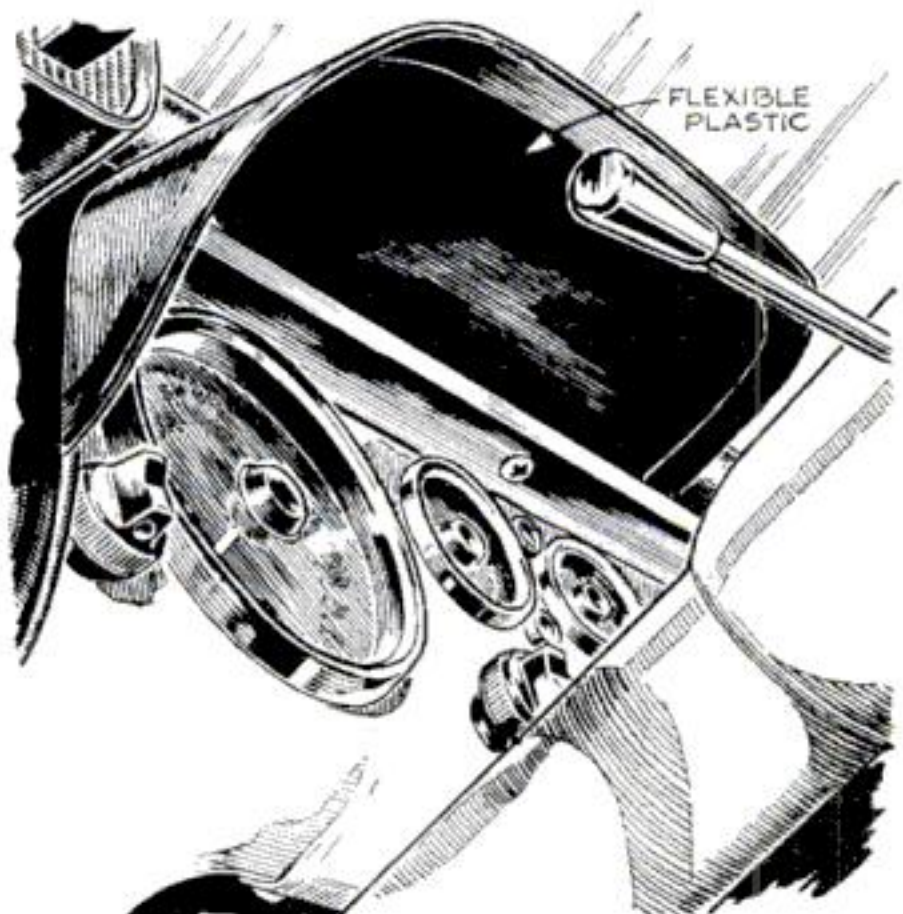
Windshield washer reservoirs need distilled water in hard-water areas—but it's not always easy to come by. For a substitute, collect water from melting ice when you defrost your refrigerator or from the plastic drain pan of an electric dehumidifier.



Similar distilled water substitutes can be used in your battery. You can carry a ready supply in your car by filling a plastic detergent bottle. Drill a 1/16" hole in the cap tip from the inside, and clean the bottle thoroughly before you fill it.

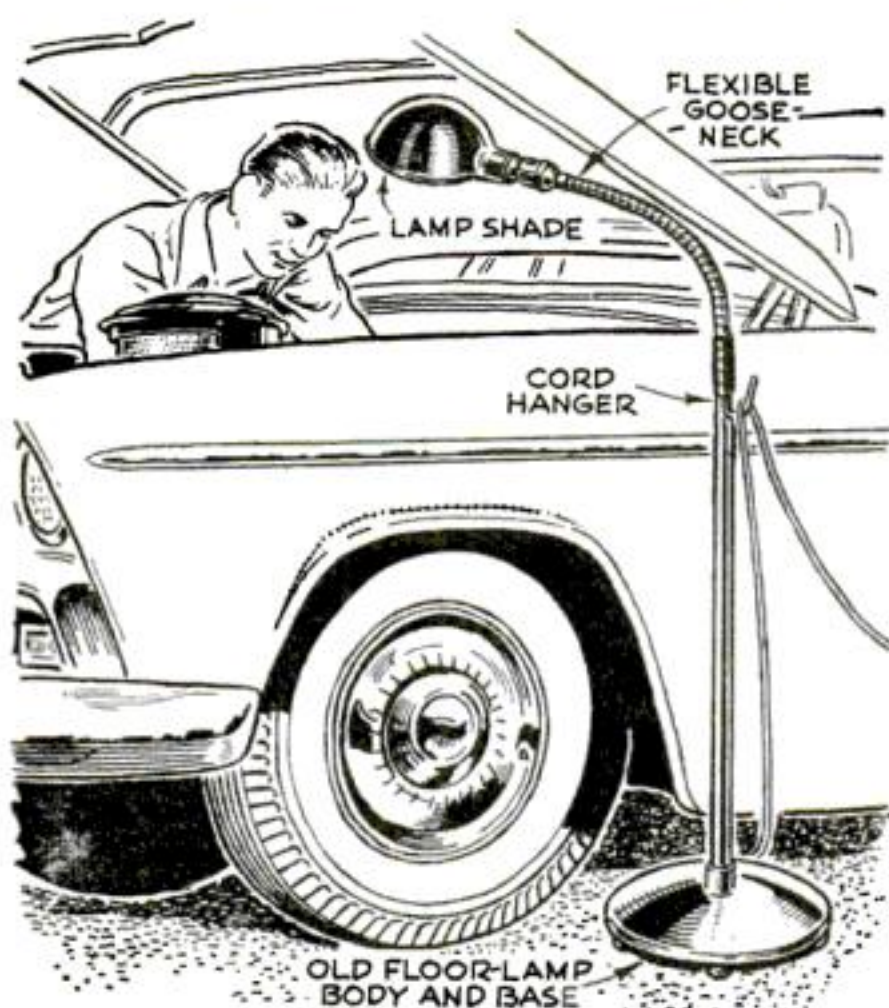


Radiator and heater hoses are too often located near oil dipstick tubes and valve covers, where they get coated with oil and start to deteriorate. To prevent this, give such hoses a jacket of foil, held in place with a wrapping of light wire.

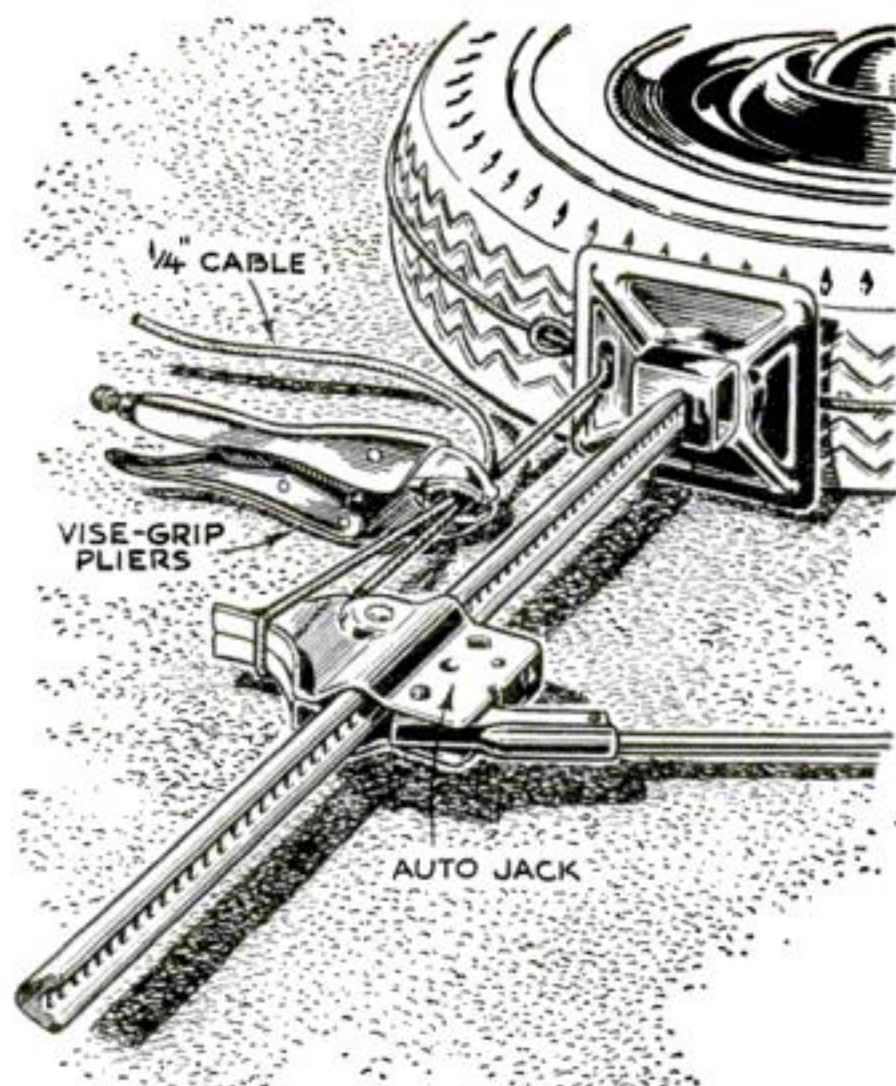


A plastic "eyebrow" can kill windshield reflections from a lighted instrument panel. Cut it from flexible opaque sheet, loosen the molding enough to slip the edge under, then retighten. If dash lacks molding, drill holes for sheet-metal screws.

More Hints from the Model Garage



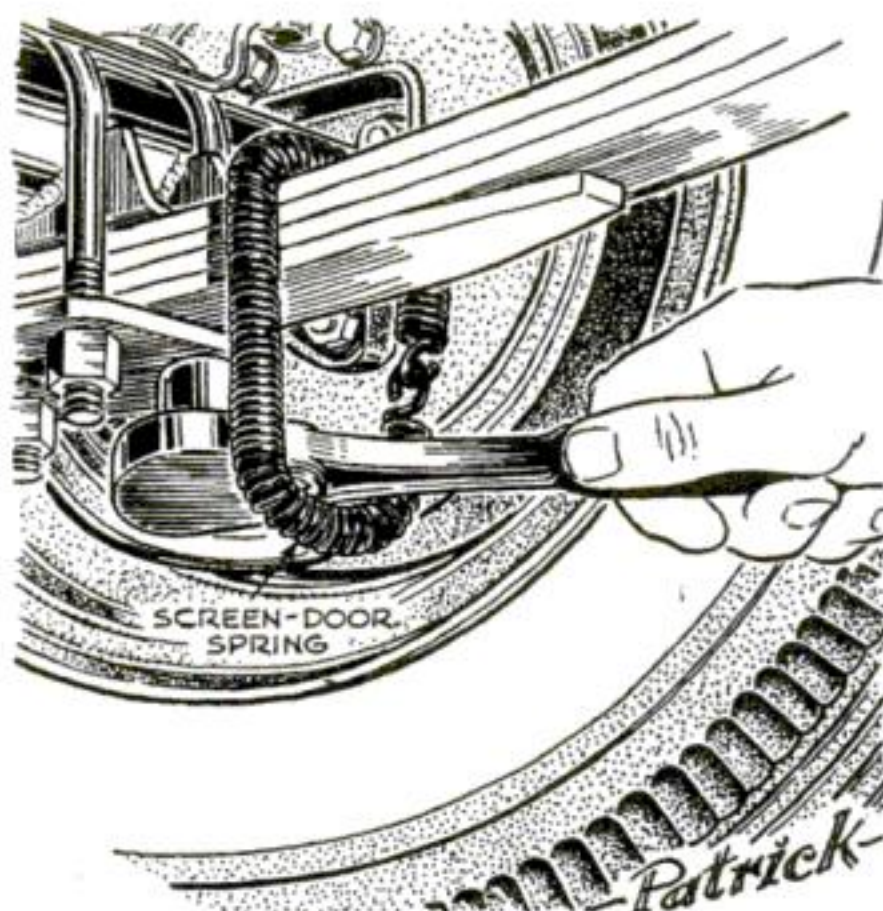
Put light where it's needed, when you're working under the hood or inside the body of a car, by rigging up this light stand. Connect a gooseneck desk lamp to an old floor-lamp stand. Add a hook to store the coiled cord when the lamp's not in use.



To inflate a tubeless tire, you need a good seal between bead and rim. Try running a cable lasso around the crown, passing the free end through the base hole of your jack and around the lift finger. Work jack to compress the tire till it holds air.



You'll never be locked out if you hide a spare door key where it's accessible from the outside. A simple way to attach it to the car body is to fasten a small magnet to the head with epoxy glue. The type of magnet often sewn on potholders is ideal.



When removing U bolts from auto springs, keep a socket wrench seated on the nut by looping a screen-door spring around the axle or spring. Slip wrench through the sling, which should be snug enough to exert tension. Wrench can be turned with one hand.

Two simple exercises that can add years to your life



PUSH

This evening, while at home, get into your car and push the brake pedal. Have someone in your family make sure both your stop lights are working. If one is out, replace it tomorrow. You'll make it easier for the other driver—safer for yourself.



PULL

Then pull the light switch. Make sure all your headlamps (don't forget the upper beam) and your rear lights are working. And while you're at it, check your turn signals. These Push-Pull exercises will do you good—especially if you find a burnout. It's very possible you will—because one out of every six cars needs a new bulb.

When you find a burnout, replace it with a dependable General Electric lamp, the brand most people prefer.

Miniature Lamp Dept., Nela Park, Cleveland 12, O.



Progress Is Our Most Important Product

GENERAL  ELECTRIC

Gus Puts the Squeeze on a Penny Pincher

By Martin Bunn

"DUCK, Boss—here comes trouble," warned Stan from the door of the Model Garage. A familiar 1956 V-8 crept painfully up the apron.

Gus Wilson looked up just as the engine, evidently starved for gas, expired. From the driver's window glared the lantern-jawed face of Silas Barnstable—a man who never spent a nickel without making sure another wasn't stuck to it.

"You comin' out, Gus, or want I should bring a law summons?" he bawled.

"Keep your shirt flap in," advised Gus, striding out. "What's up?"

Barnstable's bony Adam's apple bounced indignantly. "First off, you cheated me on them plugs I got a month ago. I got to the coast but only halfway back when she started to miss. The man showed me them plugs was burned. You told me they was colder than my old ones."

"They were and you needed 'em," retorted Gus. "You saw the blistered insulators and eroded electrodes on your old ones. If those cold plugs burned, you were scorching the road—or something else was wrong. You wouldn't let me tune the engine, remember?"

"Waste of money!" snarled Silas. "I ain't payin' that bill I owe for them no-good plugs, neither. Had to buy new ones to get back."

Gus turned and walked off. "Come back when you're ready to settle up."

"Hey, wait!" Alarm squeaked through Silas' raucous voice. "'Tain't plugs I come to see you about."

Gus paused. "Sure sounded like it."

"Fixin' to trade up, get a '58 car—two years newer'n mine," Silas went on. "Got me a buyer for this one. Sell private, buy private. Don't pay no dealer profit that way."

"Then how come I saw you drive into the car dealer's an hour ago?" asked Gus.

"Had a leetle trouble," confided Silas. "Didn't aim to bother you."

"Didn't want to show up on account of that unpaid bill," retorted Gus. "And your trouble's not a little one—you just squeaked in here with a dying engine. No buyer would touch that car with a six-foot pole, the way it is now."

"Those smart Alecs asked 20 bucks for a fuel pump!" whined Silas. "Why should I buy a new pump if I'm sellin'?"

"So you *can* sell the car."

"Aw, come on, Gus. Jest patch it up so it runs. I ain't guaranteein' it."

Gus sighed. "For the sake of your buyer, I'll try. Crank it over."

Silas turned the key. The engine cranked but made no effort to start.

"Sure you have gas?" asked Gus, aware that Silas would drain most of it from a car he was expecting to sell.

"Left in two gallons when I drove out," snapped Silas. "But once she quits, she won't start for about 15 minutes."

Facts clicked into place: To Gus's ear the engine had sounded gas-starved. The agency's diagnosis was fuel-pump trouble. New cold plugs had burned badly in a few thousand miles. And once dead, the engine would restart only after a wait.

"I'll fix both your troubles—the stalling out and your plugs burning—in 10 min-



"I'll fix both your troubles in 10 minutes or less," offered Gus. "But it'll cost you a dollar a minute."

utes or less," offered Gus. "But it'll cost you a dollar for each minute or fraction of one. Agreed?"

Silas' eyes narrowed. "You're on—but if you take more than 10 minutes I don't pay you anything."

Gus looked at his watch, hoping he hadn't outguessed himself. Then he disconnected the gas line at the carburetor and had Silas crank the engine. No gas pumped out. Gus reconnected the line,

then reached down under the fuel pump, and backed off the big thumb-screw that held on the glass sediment bowl. Removing the fiber-glass element, he dumped the bowl and wiped it out, then sauntered into the shop.

Five minutes were gone when he returned with a new filter and gasket. He carefully put the gasket and new filter in position, slid up the bowl, and tightened the big knurled nut. His watch showed two minutes to go when he straightened

up. Silas was watching him with explosive tenseness.

"Ain't you done yet?" he burst out.

"Got to recheck the gas line," said Gus, leisurely going about it as his watch crept past the nine-minute mark.

"Okay. That's 10 bucks, Silas."

Barnstable snorted and turned on the starter. It cranked over, but the engine stayed dead. Silas shut it off.

"Guess you lose, Gus," he cackled. "Now finish fixin' it—for free!"

"Not just yet." Gus knew he might be wrong, but felt that the odds were still with him. "Try again."

Scowling, Silas resumed cranking. It would take some time, Gus knew, to refill the fuel bowl. Only then would gas reach the empty carburetor.

With a roar, the engine took off. Gus held his hand out for payment.

"Not jest yet," snapped Barnstable. "I'm givin' it a good test run. Then I'll deliver it to the buyer. If it cuts out again, I don't owe you nothin'."

That afternoon, on a road call, Gus spotted Silas driving into the dealer's service shop again. But the car was a 1958 model this time. Gus was only mildly surprised when it rolled into the Model Garage some time later.

"See you sold yours," Gus remarked, looking up from a brake job.

"Yup, ain't payin' you 10 bucks, though," said Silas with sly triumph.

"That so? Got a good reason?"

"A bet's a bet, Gus. The car ran okay, but you promised to fix whatever burned them plugs, and you never touched a thing but the fuel system. I watched!"

Gus got up, walked into his office, and brought out a sheet of paper.

"Here's a service bulletin from the spark-plug manufacturer. Read it yourself. It says that low fuel pressure leans out the mixture at high speed. That lean mix causes overheating, which can burn plugs and even valves.

"Low fuel pressure *can* be caused by a punctured diaphragm, weak diaphragm spring, worn cam or pump rocker arm—or a clogged filter. That last was your trouble. I put in a new filter and fuel pressure went back to normal. Pay!"

Grudgingly Silas handed Gus a \$10 bill. "It's robbery for 10 minutes' work, but beats payin' 20 for a pump I didn't need."

Gus chuckled. "Wish I had a buck for every new pump that's sold because its fiber-glass filter is clogged. You can't blow that kind clean—the fine weave accumulates fine particles until it's so loaded gas can't squeeze through.

"When the engine's off, some outside dirt sinks down,

gas seeps through, and you can start again. But as soon as pump pressure picks up the same dirt, it clogs the filter again."

"How much is a new filter?"

"Bit over a buck," said Gus. "Your tenspot pays for that, my time, *and* the new plugs you got a month ago—which you'd still be using if you'd let me check and tune the engine then."

Silas grunted. "Guess I'd have paid you for them plugs some day anyhow."

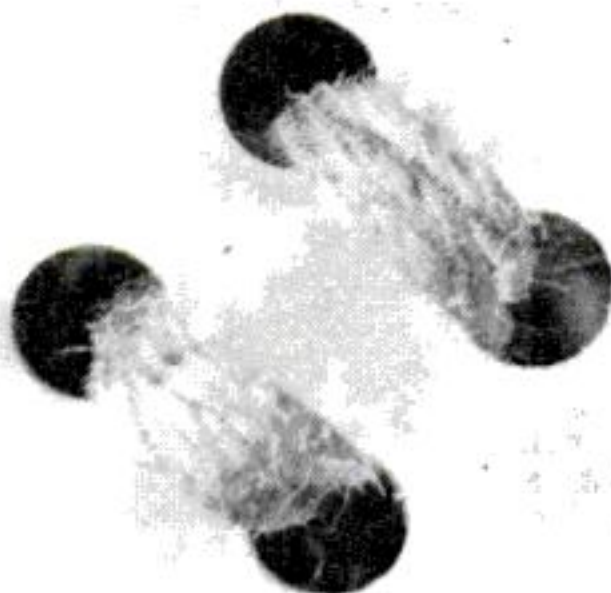
Gus glanced at the trade-in. "What's wrong with your new car?" he asked.

Silas flashed him an amazed look. "How'd you—who said anything is?"

"I'd still be waiting for my \$10 if there weren't."

A scowl overspread Silas' features.

.....
What's this a photo of?
.....



ANSWER: Not "hawsheoles" and "lines" on a ship, but thread passed through a coat button.
.....



It pays to keep your Chevy the Chevy-est

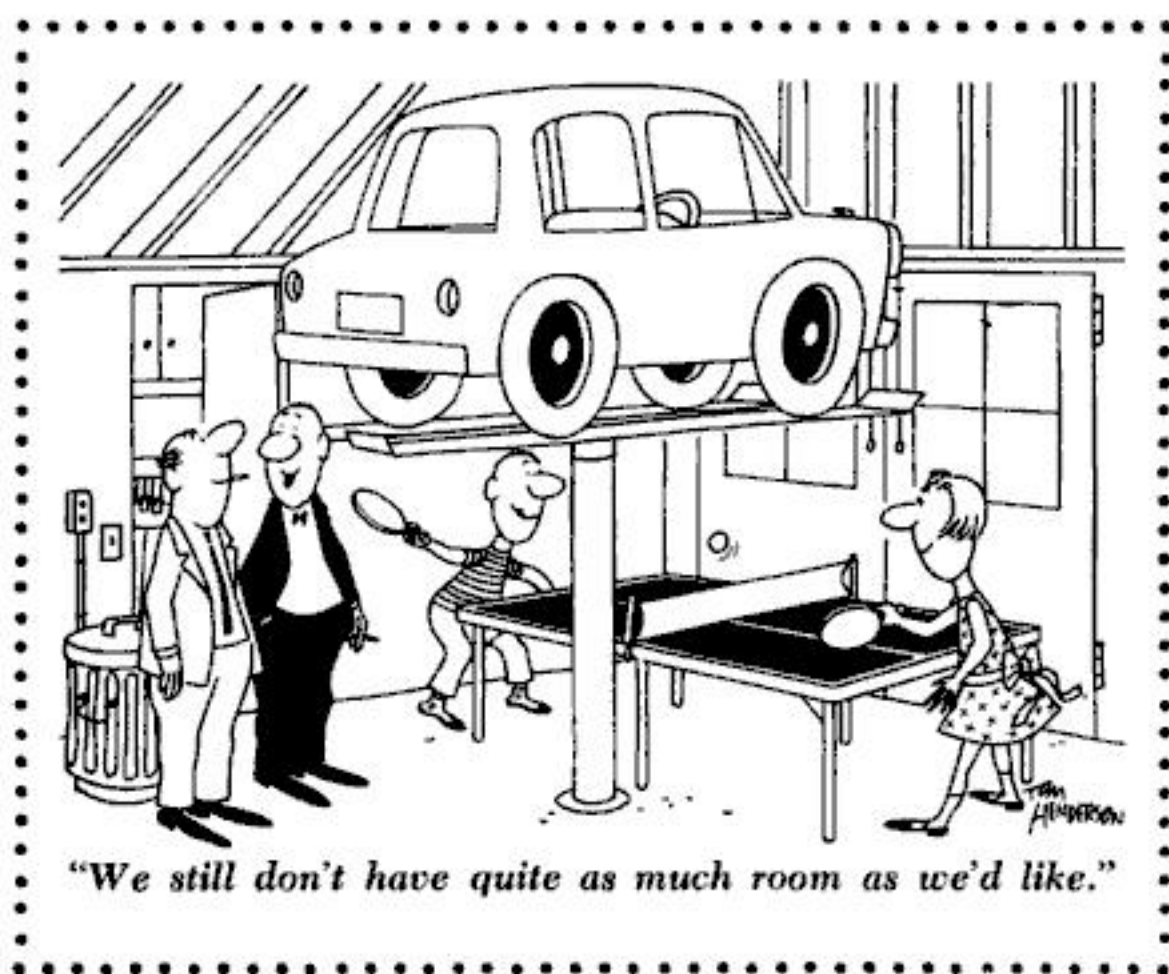
WITH GENUINE GM CHEVROLET REPLACEMENT PARTS

Naturally you care what parts go into your Chevrolet—because your Chevy does! Whether your pride and joy is a new Chevrolet or an older vintage model you're keeping in mint condition, the important thing is to use only *genuine* GM Chevrolet replacement parts. That way you're sure of maintaining the dependability that makes a well-cared-for Chevrolet such a pleasure to drive. The reason, of course, is that genuine GM Chevrolet parts are built *especially* for Chevrolets to fit right (for easy, fast installation) and work right for a long time to come. They're available at your Chevrolet dealer's and at leading independent garages and service stations. . . . CHEVROLET DIVISION OF GENERAL MOTORS, DETROIT 2, MICHIGAN.



"The cheapskate I got it from only left a quarter tankful of gas in it. I used most of that trying out the car before I paid for it. So right after, I went to a gas station.

"The guy there knew me. Soon as he heard I'd bought the car, he laughed fit to bust a hyena. He says it's a gas hog. The owner swore he'd sell it cheap because even the dealer couldn't stop it from guzzlin' gas."



"What'd they say at the dealer's shop?"
 "Tried to sell me a tune-up. But I give a mechanic four bits and asked him private. They tried new points, plugs, and carburetor jets but none of it did no good, he said. Gus, you gotta fix it—I been cheated!"

With a droplight, Gus inspected the gas lines, carburetor, and automatic choke. The choke was open and working freely. Cranking resulted in no sign of a sticking float valve or improper float level. The flexible fuel link was sound and the fuel-pump housing dry.

Gus pulled out the oil dipstick and sniffed it. Mixed with the odor of oil was the reek of gasoline. He opened the fuel filter and drew out the cartridge. It was surprisingly clean—and also smelled of gas. Gus replaced it.

"I know the trouble, Silas. If I fix it, you'll have to pay spot cash."

"Go ahead," growled Barnstable.

Gus backed out the bolts holding on the fuel pump and pulled it off.

"See that rocker arm? Most are oily and dirty. This one's washed clean—by gas leaking into the crankcase."

"Goin' to stick me for a new pump?"

Gus didn't answer. Silas watched suspiciously as Gus opened up the fuel pump at a bench and inspected the diaphragm. To Gus's surprise he found no sign of the pinholes he had expected. Then he noticed that the flange of one washer on the actuating rod wasn't turned up all around. He pulled the diaphragm gently away. Where the flange lay flat against it was a short open slit.

"There's your lost gas mileage. Faulty stamping left this washer flange flat at one spot. In time, the flexing of the diaphragm against that sharp edge cut it through. The pump still delivered gas to the carburetor—and a squirt into the crankcase each time."

Silas nodded glumly.

Whistling, Gus took apart the diaphragm assembly, put on a new diaphragm and a properly flanged washer. Then he buttoned up the pump and installed it on the engine.

"That tames your gas hog," he said. "Costs you much less than a new pump. Want to change that gas-thinned oil?"

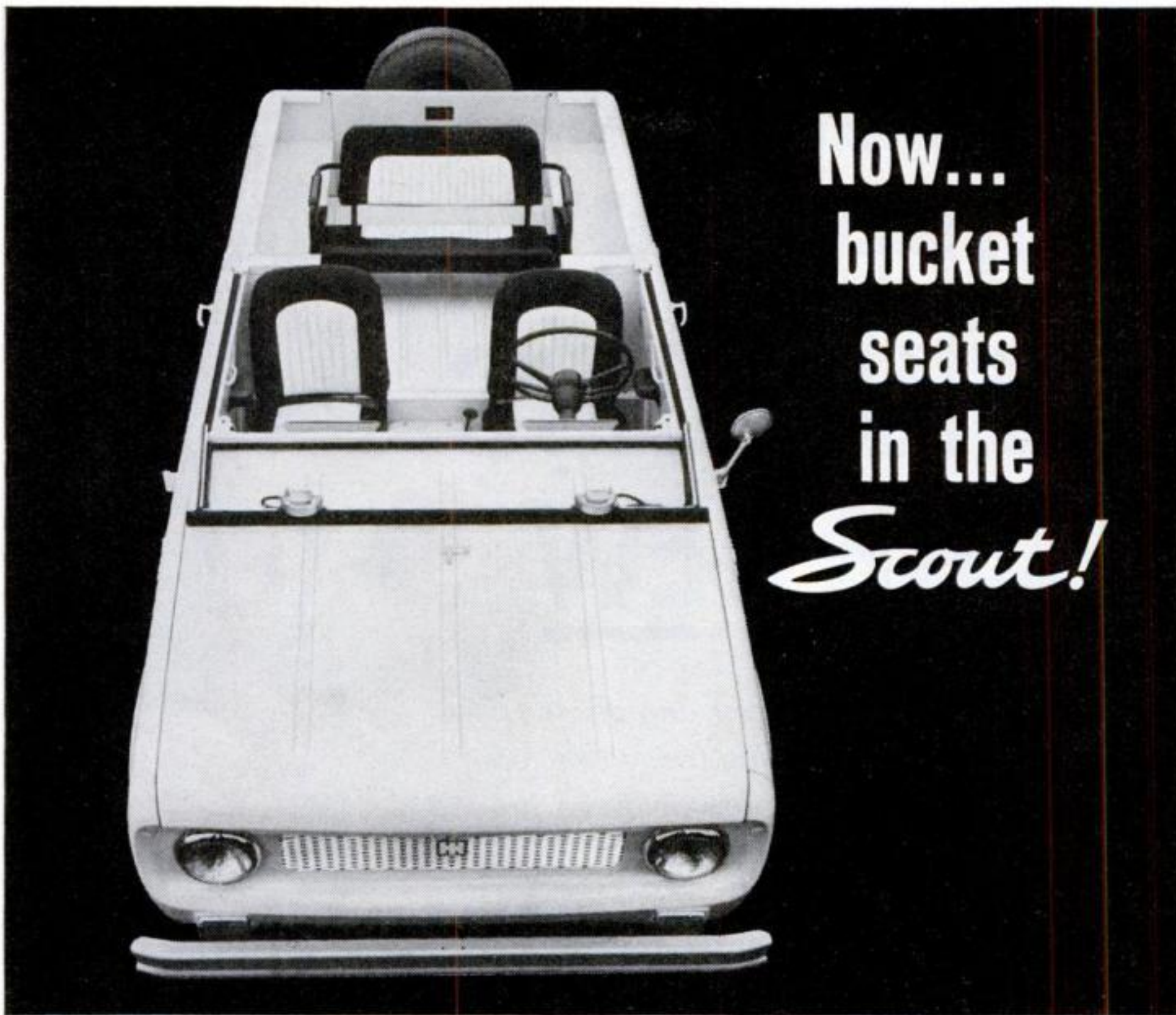
"Yup, but not here. Station out my way gives a free lube job with each oil change. How much you askin', Gus?"

Stan shook his head as the car drove out of the shop. "Boss, you're too good to that skinflint. I'd have sold him two new fuel pumps."

Gus shook his head. "No, you wouldn't. There's just one fellow Silas has to watch out for."

"Who's that?"

"The one who's just as sharp as he is—and a little more crooked." ■ ■



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Scout!

Yes, bucket seat comfort in the SCOUT by INTERNATIONAL, along with easy-access 2-passenger rear seat. This "4-person" roominess is the latest in a long list of SCOUT surprises . . . features that make it the most complete action vehicle you can buy today!

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THESE 1963 MERCURY OUTBOARDS ARE NEW

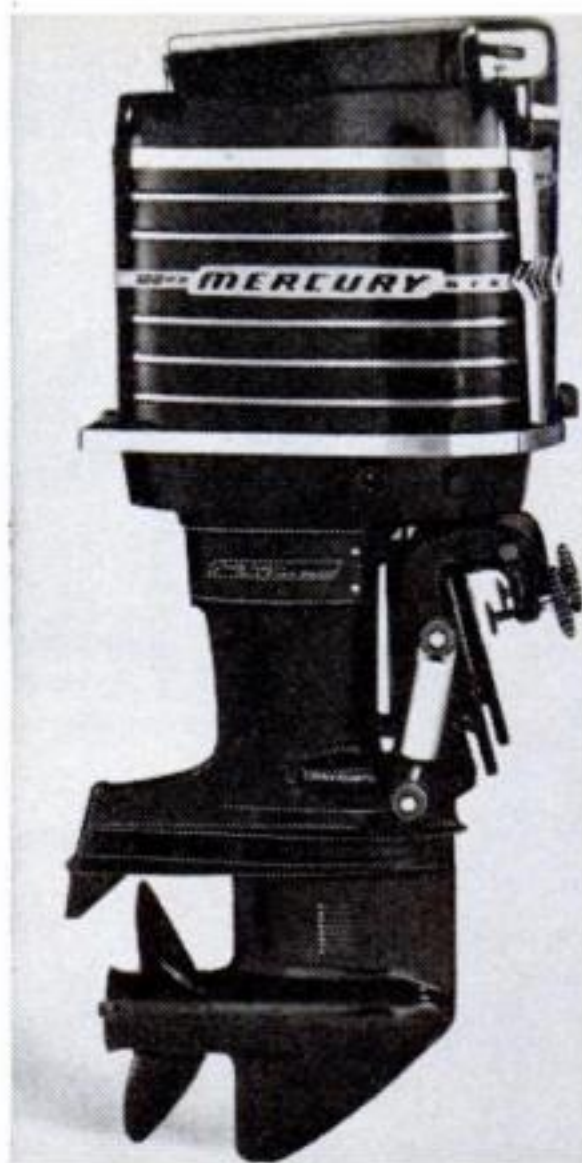
... to everyone except our engineers (who have spent years crafting these precision engines), our test drivers (who have proved them out over a million miles at Lake X, Florida), and our factory-trained dealers (who are anxious to show you how the '63 Mercs can give you more RUN for your money). See your Mercury dealer soon. He's listed in the Yellow Pages.

The finer facts for outboard buffs: New weedless water pickup/anticorrosion trim tab for salt-water protection/fixed-jet carburetion/Jet-Prop exhaust/low-level water pump for easier service/Power-Dome combustion chambers/balanced manifold system/heavy-duty alternators/long and short shaft for 15" or 20" transoms available on all models/die-cast, one-piece lower unit housings/single-lever control of throttle, forward, neutral, and reverse/complete selection of props for any power need.



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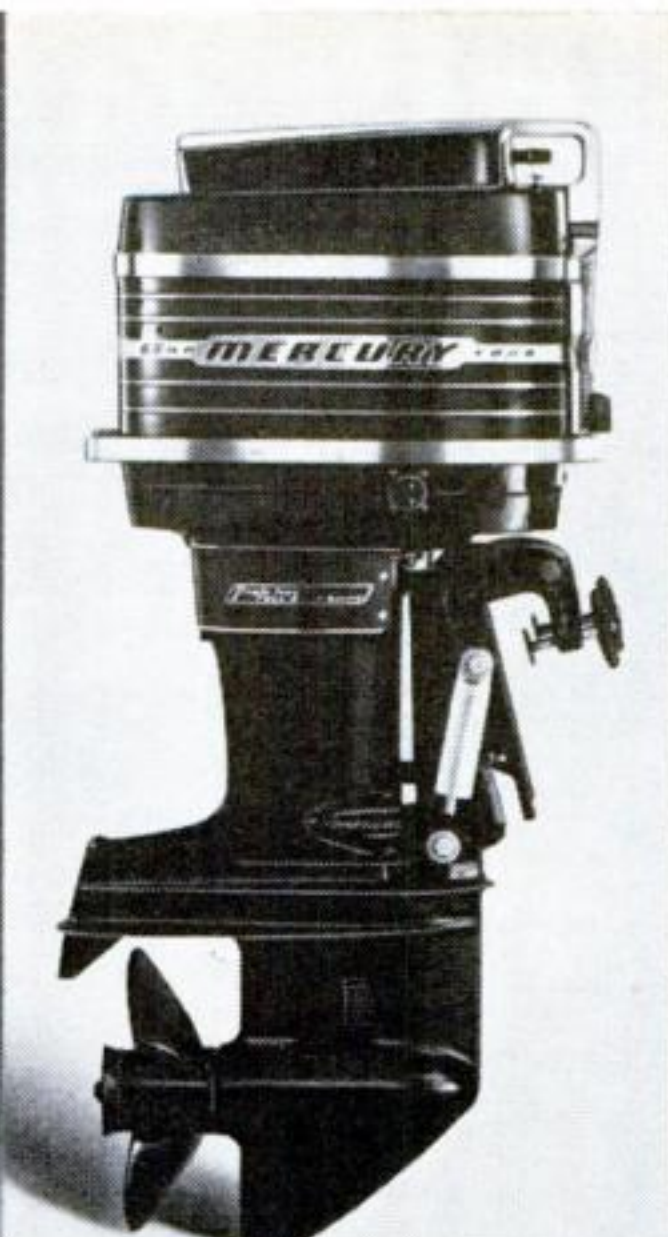
NEW MERC 1000: 6 CYLINDERS, 100 HP



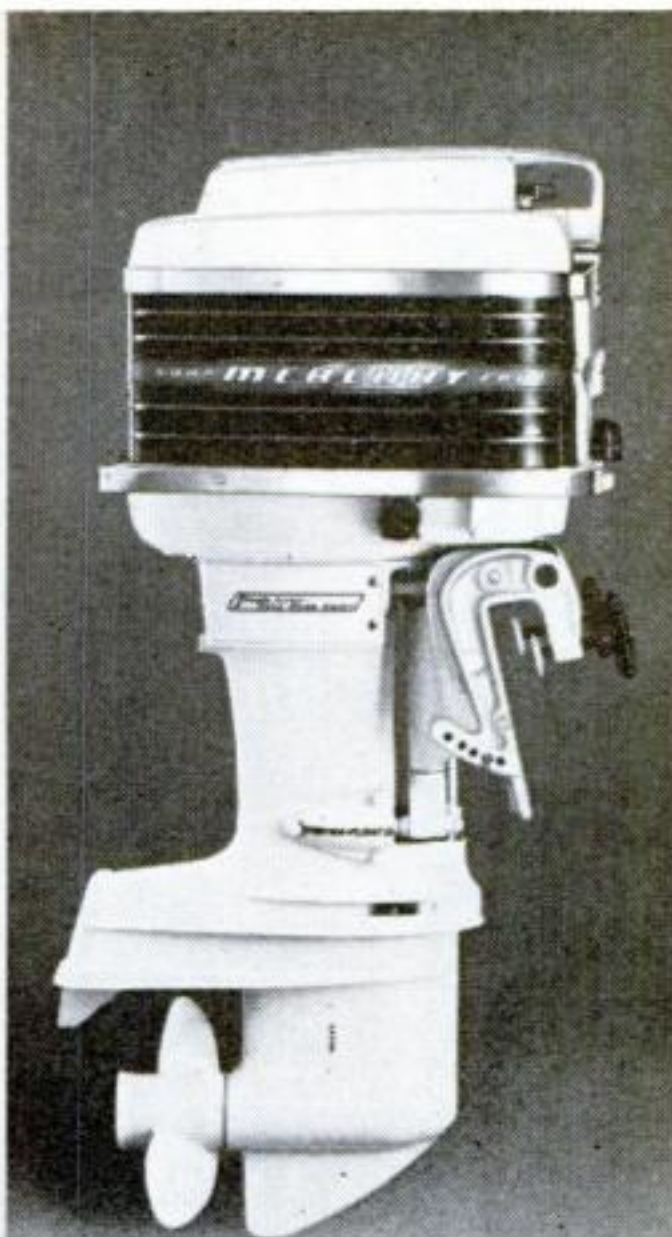
NEW MERC 350: 2 CYLINDERS, 35 HP



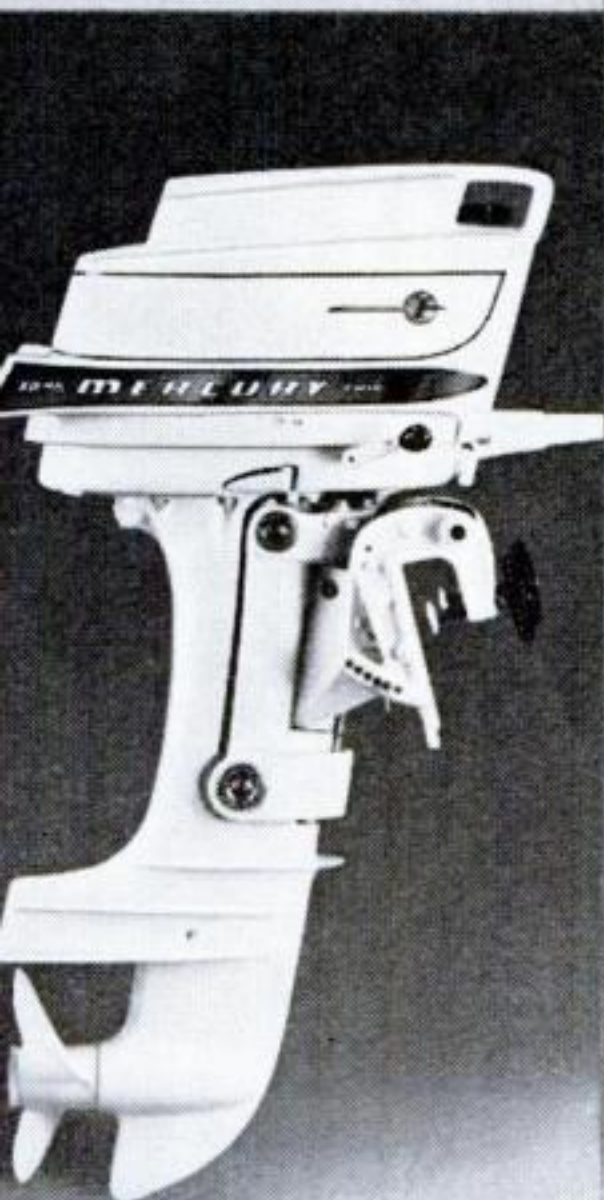
NEW MERC-850: 6 CYLINDERS, 85 HP



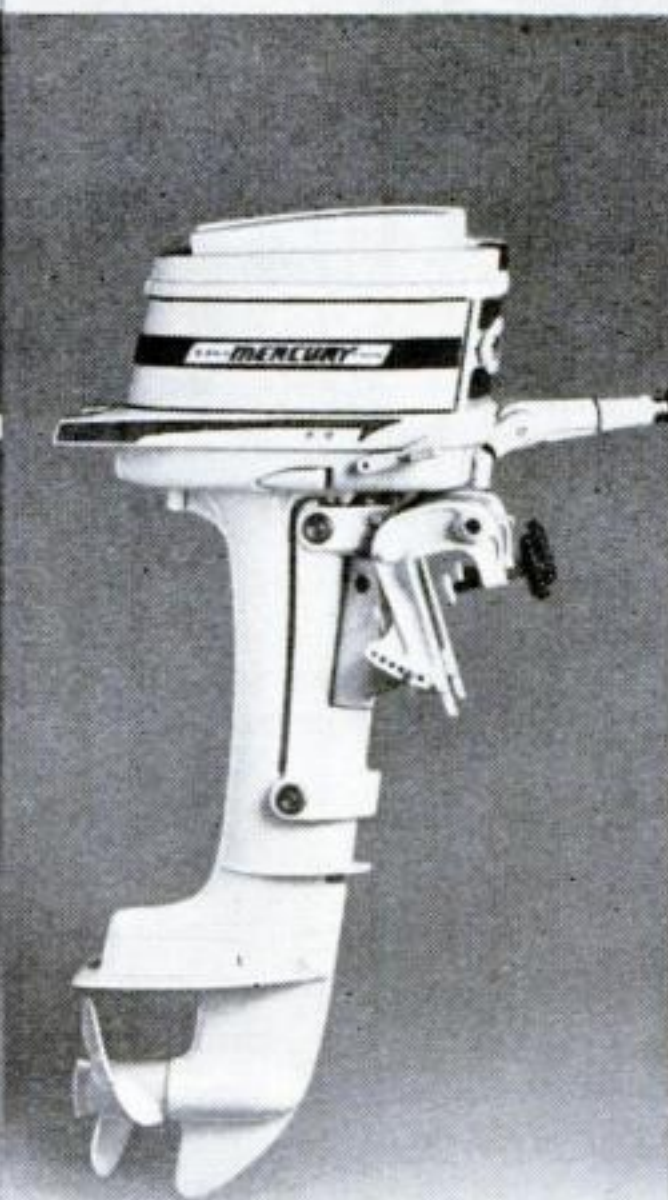
NEW MERC 650: 4 CYLINDERS, 65 HP



NEW MERC 500: 4 CYLINDERS, 50 HP



NEW MERC 200: 2 CYLINDERS, 20 HP



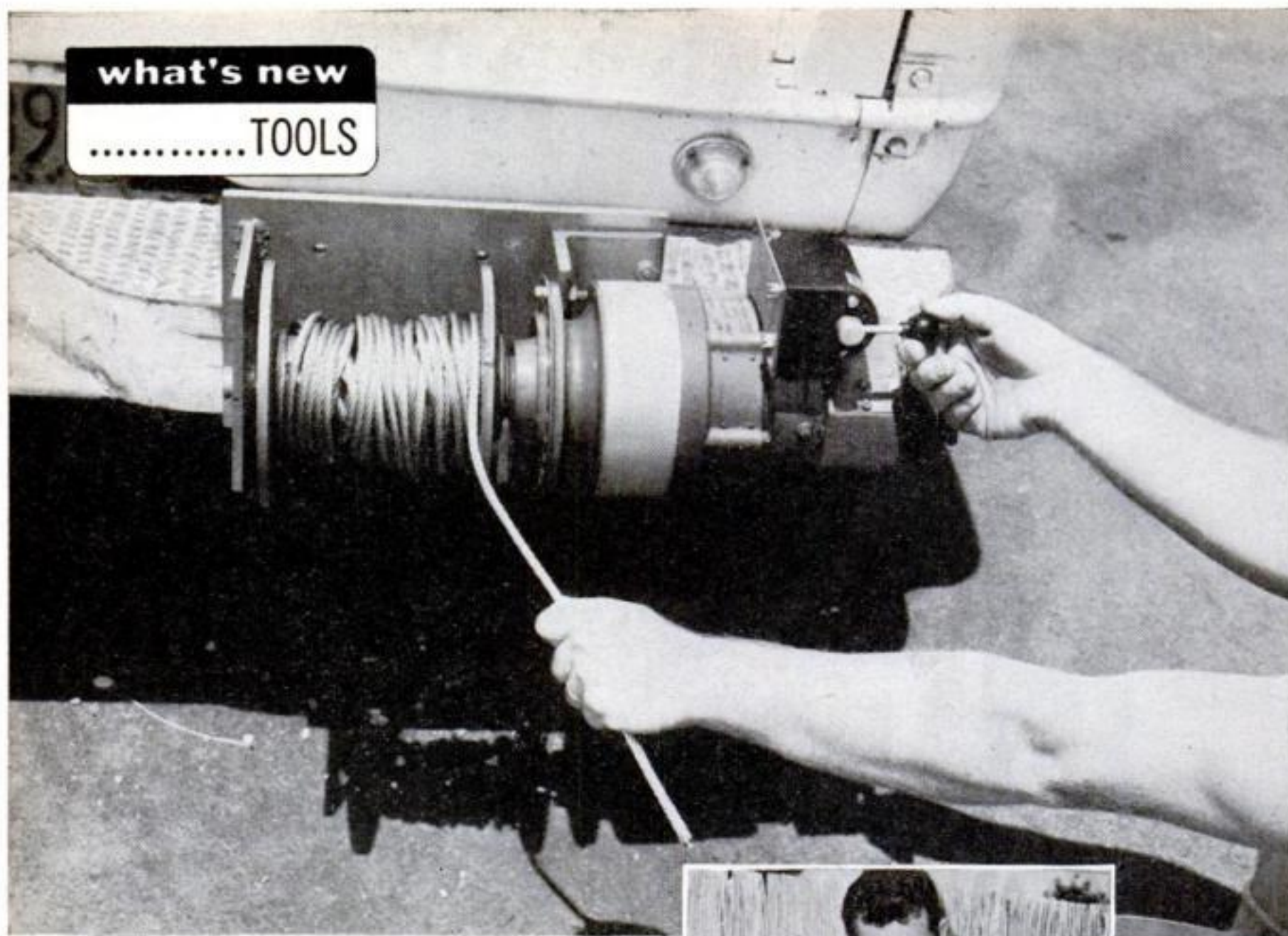
NEW MERC 110: 2 CYLINDERS, 9.8 HP



NEW MERC 60: 2 CYLINDERS, 6 HP

what's new

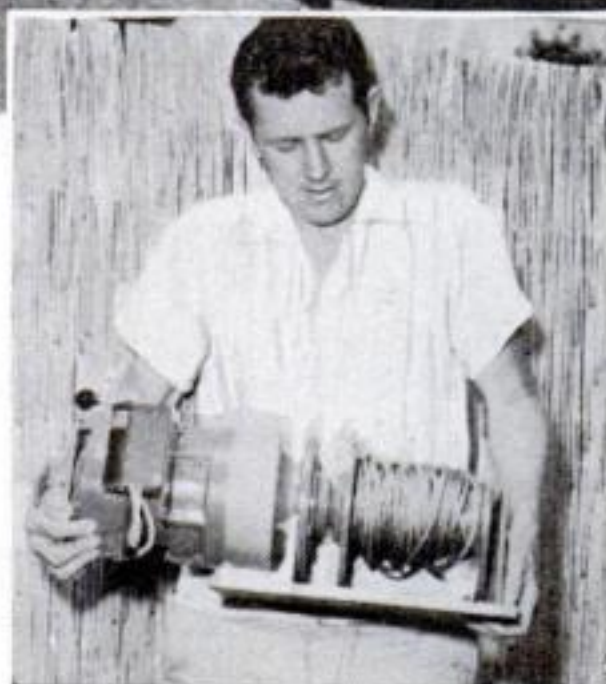
.....TOOLS



Portable Winch Runs on a Car Battery

You can stow this husky little electric winch in a car or boat and have it ready for instant use anywhere. It runs on any standard car or boat battery and is available in 6-, and 12-, and 24-volt models. The winch weighs only 58 pounds, but it will haul loads from 2,500 up to 6,000 pounds, depending on battery capacity.

A predrilled baseplate lets you bolt the winch to a car bumper or lash it to a



tree. Flip a switch and the drum reverses to reel cable in or out. A brake control stops the drum to hold a load at any point. The drum will take up to 250 feet of $\frac{1}{4}$ " steel cable. The winch sells for \$72.50 from Airborne Sales, Inc., 8501 Stellar Drive, Culver City, Calif.



Tiny iron for delicate hi-fi soldering

This slim, needle-tipped soldering iron sneaks easily into hard-to-reach chassis parts and helps you make delicate connections on printed-circuit boards. It's available in various combinations of heating-element capacities and different types of screw-on tips. Made by GE, it sells for about \$7.50 with one heater and tip.

KEEP YOUR SHOP OPEN AFTER STORES CLOSE

Stock your workshop
with a Weldwood
Fix and Finishes Shelf



TACKLE TOUGH CHAIR REPAIRS with Weldwood Plastic Resin Glue. Makes joints stronger than the wood itself. Combines great water resistance with high strength for permanent load-bearing bonds.



ERASE SCRATCHES AND MARS with Weldwood Putty Stiks®. Fill nail holes or repair any minor imperfections in finished paneling or furniture. Available in a wide variety of colors.



REVITALIZE FINISHES. Remove all wax, sand lightly, wipe on Weldwood Deep Finish Firzite®. Presto! On new work, use it for an effortless low luster Danish-type finish with a hand-rubbed effect.

How many times have you put off jobs because you've been out of a material—and the stores are closed? It's irritating and time wasting. Make full use of your time this Fall and Winter. Be ready to work when you have the time and the inclination. Stock up on the products featured here (especially Deep Finish Firzite, which you'll need also as a sealer for perfect paint jobs). You'll find them at your local lumber dealer's, at paint and hardware stores. Get them now!



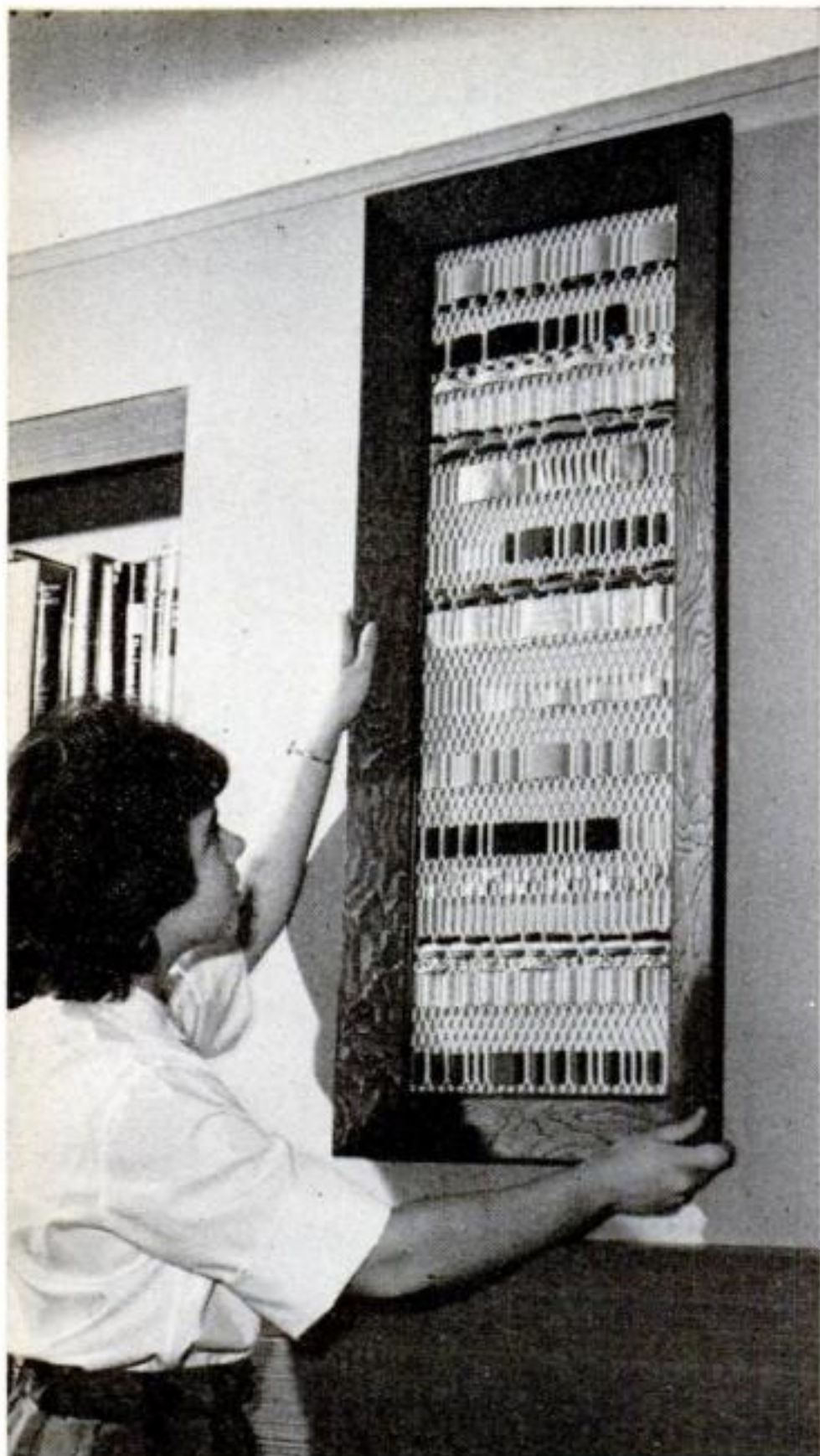
Products of United States Plywood

Conversation Piece of Metal Mesh

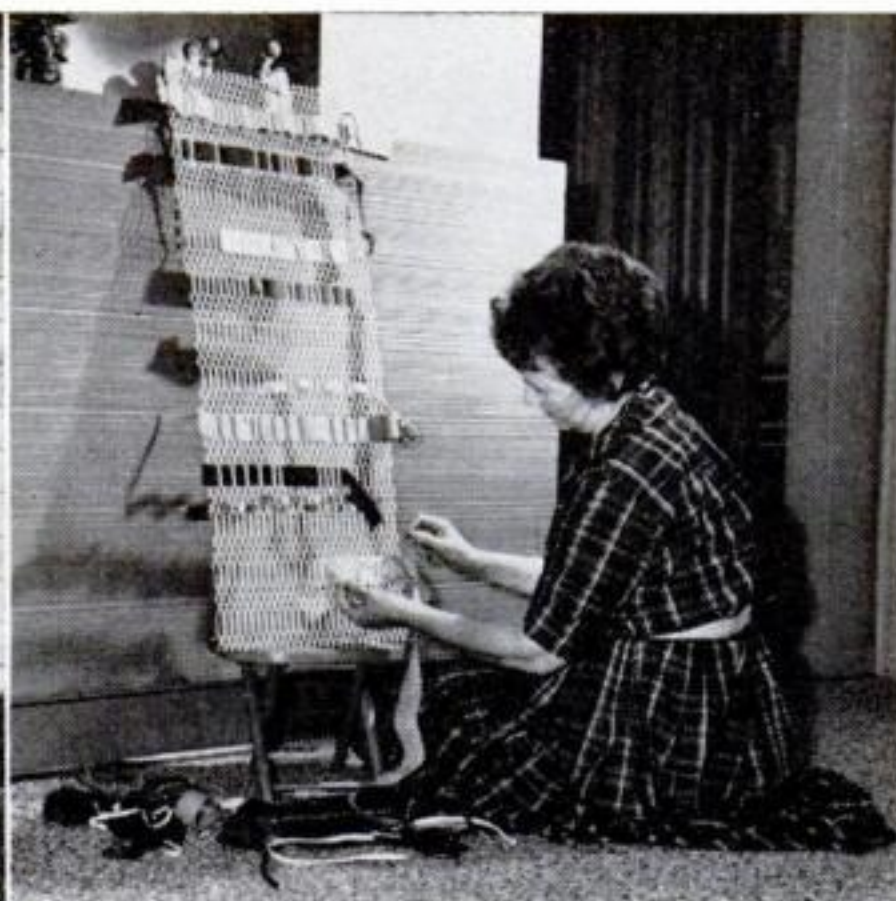
A STRIP of expanded metal 12" by 36" with an interesting pattern in its mesh inspired this decorative panel. Created with a minimum of time and money, it provides a colorful center of interest in the room.

The metal was first spray-painted. Then I threaded strips of various materials that repeated the living-room colors through the loops. I skipped some sections and left some rows incomplete to give variety. The weaving materials provided further variety in widths and textures since they included household remnants of rug binding, yarn, felt, cork, plastic, leather, and even straw and copper.

The panel was set in a wood frame without backing so that the wall itself would silhouette the pattern. Since the design is abstract, it may be hung either horizontally or vertically. Total cost, exclusive of frame, was less than \$4. A larger panel would make a room divider; several joined, a floor screen.—Mrs. H. M. King, Dearborn.



Spray-painting the piece of expanded metal is first step. Any light-color paint will do.



Weaving strips of various materials through mesh of the metal creates interesting pattern.

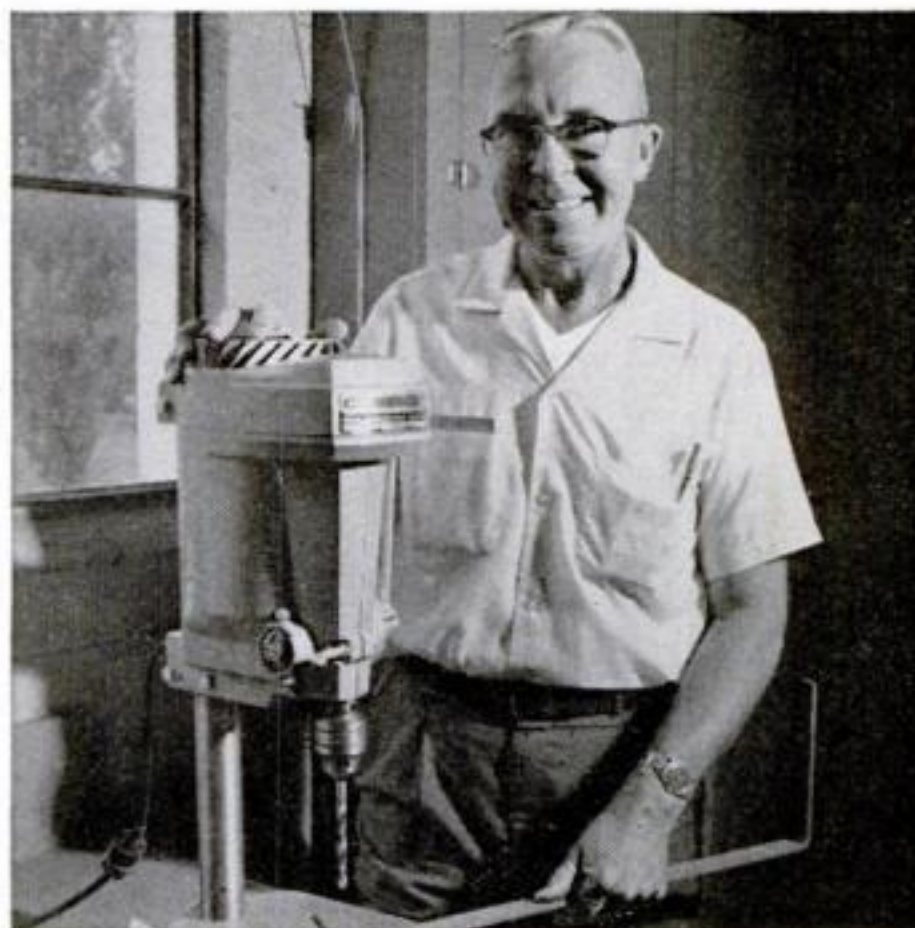
Owners Report on new Compactool

Read how users are getting "big tool" accuracy in lightweight, low-cost power tools with built-in motors



L. W. HAMMELL, San Jose, California

"Actually this COMPACTOOL Circular Saw is my first stationary power tool. I've seen other, much heavier saws demonstrated, but I feel my 'compact' can hold its own with the best of them in its size range. It's accurate and quiet—doesn't whine when you use it. I think it's great to be able to take it anywhere you want—in or out of the house."



JOHN W. HALLAM, Washington, Pa.

"I bought this COMPACTOOL Drill Press for work in my sign shop. We use it mostly for drilling angle iron, $\frac{1}{4}$ " strap iron and pipe for sign hangers. When we do a store front, I take it along in my truck. We give power tools an awful beating—but this Drill Press does as well as anything three times its size—and holds up just as long."



RALPH ADDY, West Lafayette, Ohio

"I've had access to other, much bigger jointers in Industrial Arts shops, lumber yards and pattern shops, but this is undoubtedly the most complete and powerful small Jointer I've had the opportunity to use. It's really accurate—gives a smooth finish that couldn't be improved on with any size jointer. But the best surprise of all is that I got my COMPACTOOL Jointer as a Christmas gift—from my wife!"

Compactool

by the makers of famous Delta, Porter-Cable and Walker Turner power tools

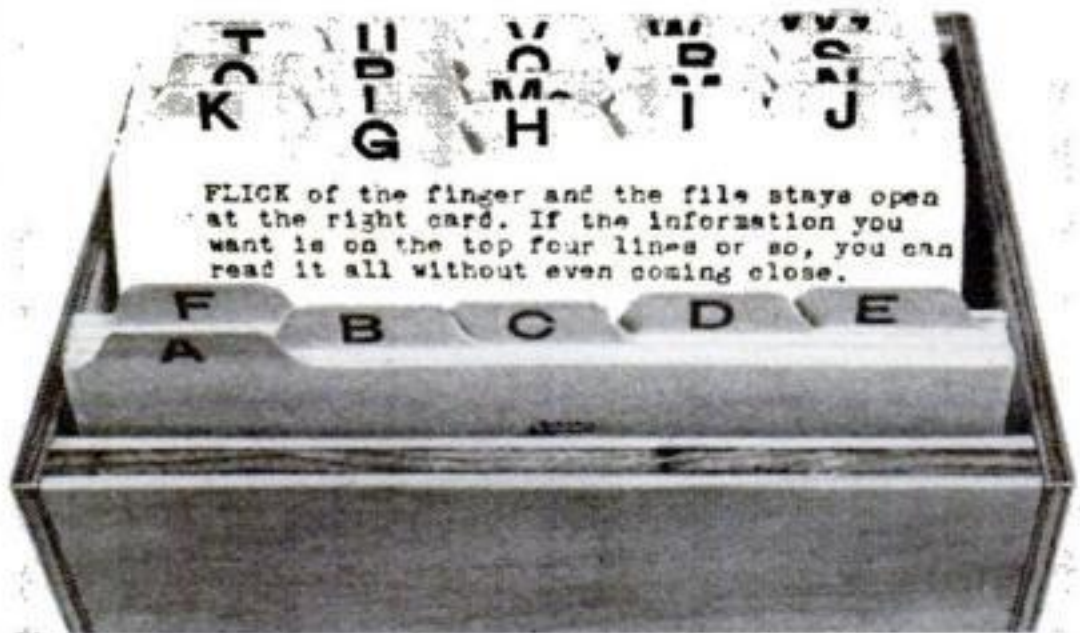
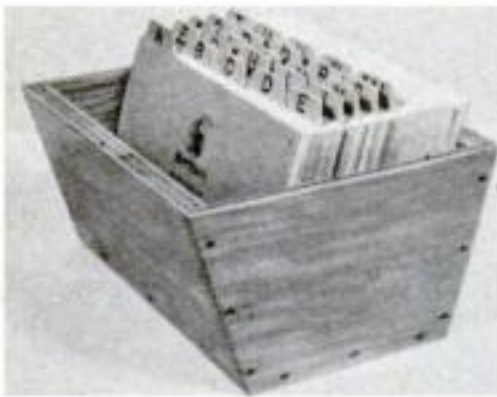
Rockwell

MANUFACTURING COMPANY
Pittsburgh 8, Pennsylvania



Short Cuts and Tips

FROM
PS
READERS

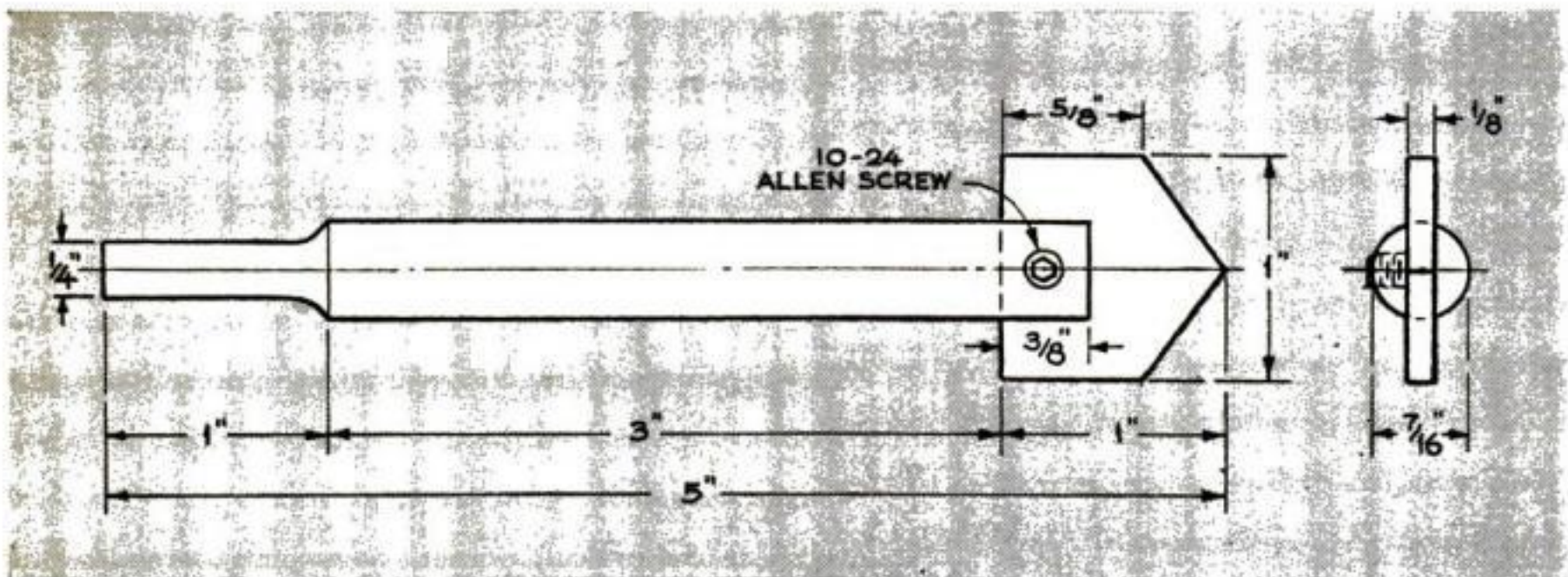


Card file for faster flipping

It's the kind of bright idea that makes you wonder why it wasn't thought of before. A hopper-shaped card tray eliminates the clumsiness of the usual file box—and is especially handy beside a phone. All necessary data is found with a flick of a finger; the file stays open to the right card, and you can read the top four lines (shown in photo at right) without removing the card. A 15-

degree slope, front and back, is just right.

Front, back, and bottom are $\frac{3}{8}$ " plywood, cut to width as one long piece. Design the tray to hold a precise number of cards—including spares at the back. Pile up the cards and dividers you'll use; the height of this stack is what you mark off for the length of the bottom. Cut these lines with your saw set for 15 degrees. The sides are $\frac{3}{16}$ " ply, fastened with glue and brads.—*Lewis A. Harlow, Boston, Mass.*



Large-diameter bits from scrap

To drill large holes through wall studs for electric cable, I needed a short, fat bit. I made one from a bolt and a piece of flat

stock, as shown. Later, needing an extra-long bit, I made one the same way, using a steel rod for the shank and adding a set-screw so I could use different-size cutters.—*John A. Fogle, No. Sacramento, Calif.*

▶▶▶When we moved to a new home, our two open bookcase units, placed end to end, were a foot short of filling the wall space between a corner and the door. We lengthened them to fit by simply pushing them apart and installing shelves between. We screwed small wood cleats on the facing ends so that 12"-long boards slipped on top of them would line up with the existing shelves.—*P. E. Fitzpatrick, Gary, Ind.*

▶▶▶The rubber bushings for the spring-type shock absorbers on my boat trailer had to be replaced, but they had flanges, and I couldn't find duplicates. So I bought solid bushings with the same inside diameter, and an outside diameter to match that of the old flanges. I forced these on a dowel and turned them against the blade of my bench saw set at a height equal to the flange width.—*E. Olson, Duluth, Minn.*

What's it worth to feel like a man?



If you won't settle for less, the Army's the place for you

You feel like a man

when you can do a man's work, put your mind and muscle into a job you can be proud of . . .

when you can live a man's life, get out of the rut, travel clear across the world . . .

when you can decide for yourself what you want from life, what kind of work, what kind of play, what kind of future.

You feel like a man in the Army

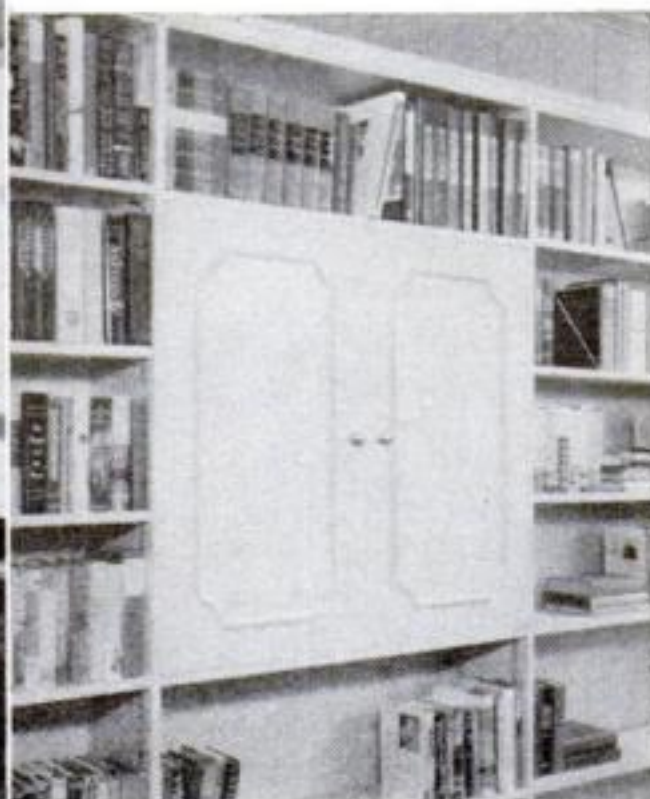
because you can prove yourself physically, mentally and emotionally fit to do a man's work. You can have the satisfaction of helping to keep America so strong the war the whole world dreads need never happen . . .

because you can visit strange and romantic countries while you're still young enough to see everything, do everything, get all that travel has to give you . . .

because you can decide your own future. You can get a good education, you can get training in your choice of many different fields. The opportunities for advancement, the chance to become a leader as a commissioned or non-commissioned officer, the retirement prospects . . . all are better than most men think.

You can try the Army on for size . . .

There's nothing quite like an Army career; you don't have to gamble years in a job that may not work out for you. Fulfill your military obligation in the Army, and you'll have a chance for a good, close-up look at Army life, Army men, and Army opportunities. Then you may decide it's Army for you all the way. (Choice of job training before enlistment for those who qualify. See your local Army Recruiter or write: Army Careers, Dept. of the Army, Washington 25, D. C., Attn. E.P.P.P.)

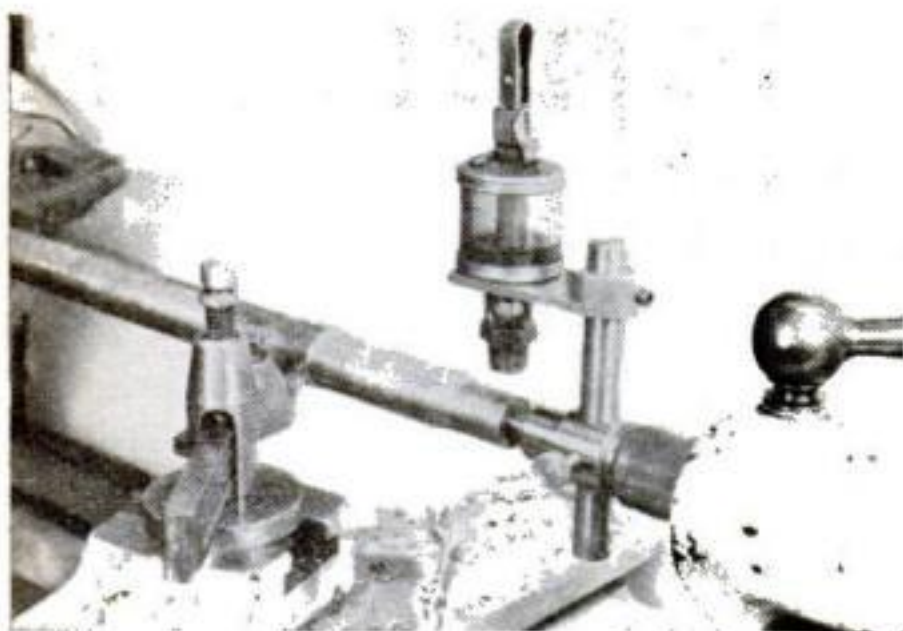


Grooved plywood for built-in shelves

An unexpected use of grooved plywood siding can simplify bookshelf construction. Only those shelf boards which are to be permanently located (and are required for structural strength) are nailed in place. The rest can be adjustable.

Here's where the grooves in Douglas Fir Plywood Texture 1-11 can save sweat. For short shelves (as in the enclosed cupboard, above right) trim a strip off one end of a panel of 1-11, and apply it as a facing to

the uprights (at left in first photo). The $\frac{1}{4}$ "-deep grooves provide ready-made dados for slipping in as many shelves as you need. To install longer, thicker shelves, buy a panel with grooves spaced 8" apart, and rip it parallel to the grooves. In this case, the resulting $\frac{3}{8}$ "-thick strip serves as the upright itself, (at right, same photo), and provides two grooves for recessing adjustable shelf standards. This gives a neater appearance than surface-mounted standards, eliminating gaps between the uprights and the ends of the shelf.

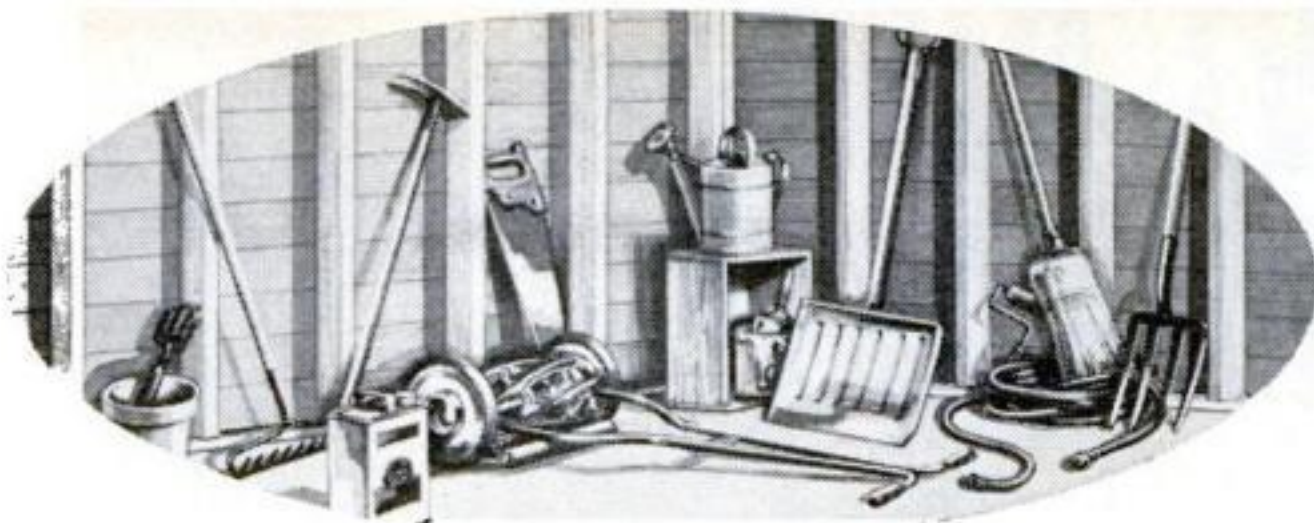


Lubricate a tail center automatically

To prevent burning the tail center when doing high-speed turning or polishing jobs, I use a salvaged sight-feed oil cup. Once the cup is adjusted to give a continuous drip of lube oil to the center, it needs no further

attention during the job. The oiler is mounted on a support held on a special tail center. Choose dimensions for the support to suit your lathe, as shown in photo (left). Make the special center of tool steel; harden and grind the steel center to size.—H. J. Gerber, Menomonie, Wis.

CRAMPED, OLD-FASHIONED MESS...?



Organize your garage with
PRESTO PEG-BOARD

New Presto Peg-Board by Masonite makes it easy work to transform children's rooms, garages, utility rooms into neat, well-organized areas. No need to paint Presto Peg-Board Hardboard. It comes prefinished in an eye-pleasing pattern.

More good news: this strong, heavy-duty Presto Peg-Board is priced so low it will amaze you. Why not start from the plans we'll send you? Just fill in the coupon.



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 Send me plans booklet and literature for Presto Peg-Board.

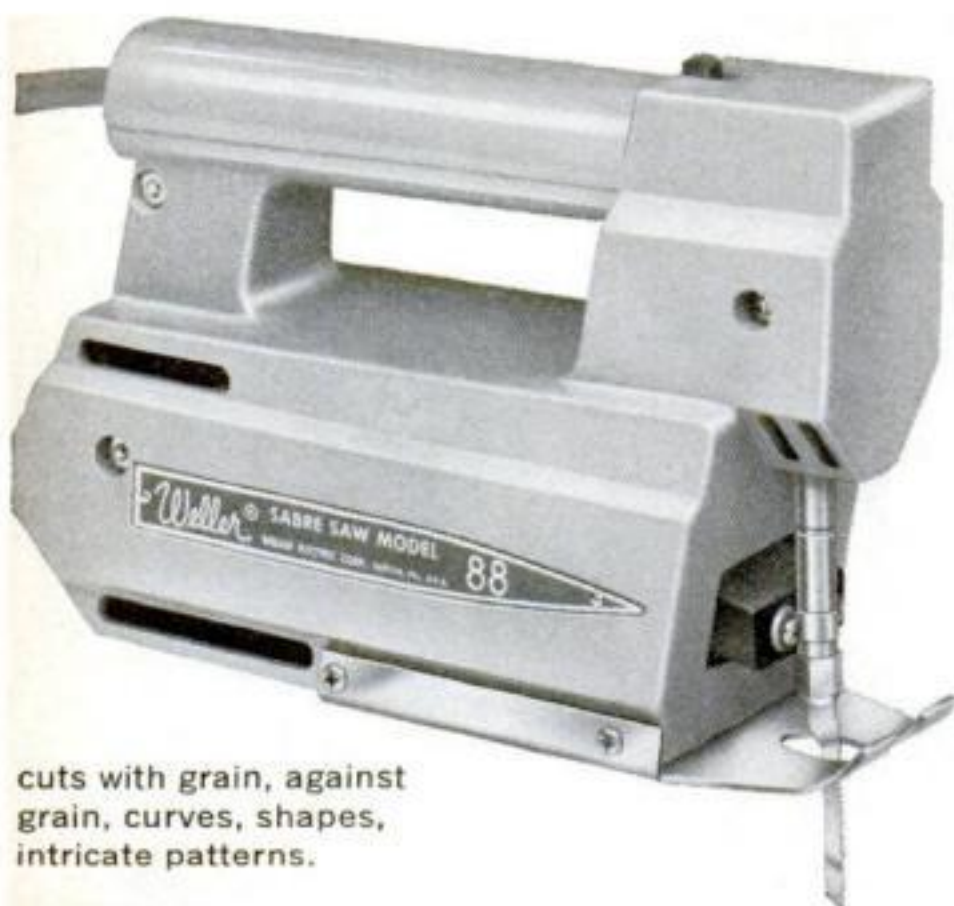
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cuts with grain, against grain, curves, shapes, intricate patterns.

Weller® Hi-Speed SABRE SAW

Combines extra-fast cutting and easy guiding. Makes all kinds of cuts through wood (up to 1" finished stock) and many other materials. Powered by Weller's new heavy-duty, 4.8 ampere reciprocating motor. 7,200 cutting strokes of $\frac{3}{16}$ " a minute. Cuts smooth. Never bucks, splinters or tears. Makes its own starting hole for inside cuts. Trouble-free. No gear box, commutator or brushes to wear out. Never needs lubrication. Safety design. UL approved for ungrounded 2-wire operation. 5 assorted blades and blade-changing wrench included.

\$22⁹⁵
MODEL 88

WELLER ELECTRIC CORP., EASTON, PA.

For Mercury: Zoom!

[Continued from page 77]

engine, and transmission noise is reduced to a whisper by an elaborate envelope of insulation. Alternators are standard. The car shares with other company vehicles transistorized radios with AM-FM receivers.

A tachometer and a swing-away steering column are options.

Continental The posh Continental, Ford Motor's contribution to the man who has everything, published its news with, appropriately, a Rolls Royce accent. There was quite a bit of it. For instance:

Aluminium (sic) brake drums on the front, old chap, heretofore only on the convertibles, now come in the sedans. More stops with less—what do they call it?—fade. Makes the tyres grip.

Engines? All right, old boy, but one doesn't talk about power, y'know, not in a Continental. A new piston development reduces all that thrashing around in the cylinders with poor petrol.

Then there's that new carburetion. Quite the thing, really. It's a four-holer. The two primary barrels operate 90 percent of the time, which is from idle to—if you insist on statistics—75 miles an hour. The throttle plates open the other two barrels beyond that.

An alternator in place of a generator, of course. It has that new AM-FM radio, and when it's on FM there's none of that annoying blackout under bridges.

Meteor New station wagons bow in for the Meteor, opposite number in the Mercury line to the Ford Fairlane, with rearward-facing third seats. An electric tachometer, with an error of less than one percent, is yours at extra cost.

Comet Bucket-seated convertibles make their appearance in Mercury's compact car. That major lubrication each 1,000 miles in 1962 is stretched to 36,000. A new fuel filter is good for the same distance. ■ ■

WIDEN YOUR FUN HORIZONS

... GO

HARLEY-DAVIDSON IN

'63!



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HARLEY-DAVIDSON MOTOR CO.
Milwaukee 1, Wisconsin

lands at the end of the stroke, hands are crowded together at the handle end. Do it right and you'll sink a well-sharpened axe at least two inches into hard oak.

The short-handled stroke also starts overhead, but omits the sliding hand action, maintaining the hands-together grip from start to finish. In either stroke, the expert breathes in as he raises his axe, and exhales almost explosively (you can hear the snort) as he brings it down, giving him full flexibility amidships. This breathing rhythm is a point worth copying by the back-yard chopper.

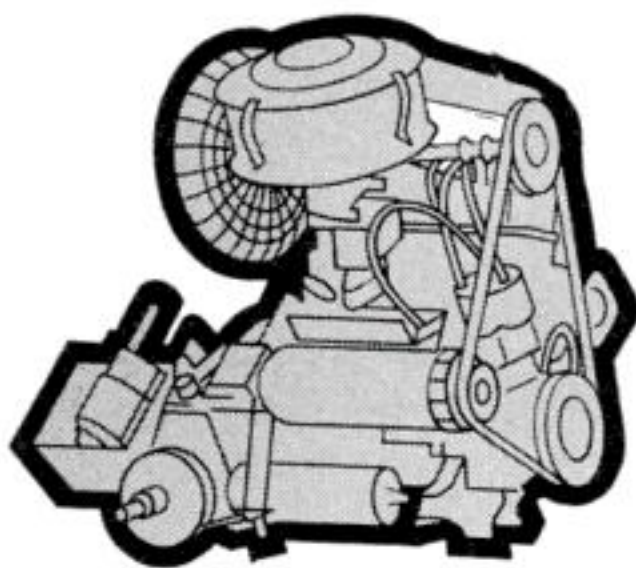
Another contest measure that will improve your axe work: Mark out the cut with crayon or chalk before you start. It's easier to hit a line if there's a line to hit.

Two cutting angles figure in Geer's chopping. The *cutting stroke* enters the wood at about 45 degrees. The *chipping stroke*, swung into the other side of the notch, enters more steeply so the axe's wedging action shears the intervening wood along the grain, breaking it free in chips as heavy as four pounds.

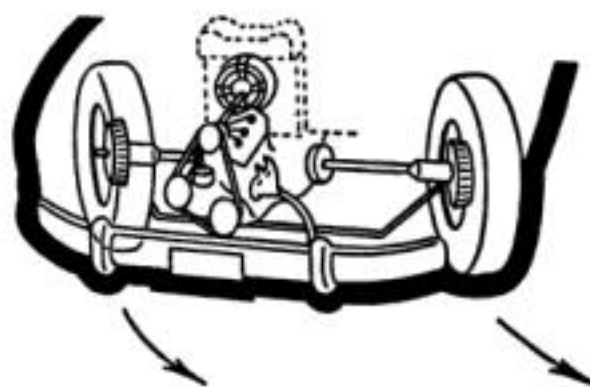
Sharpening an axe is an art about which every champion has a few secrets of his own. Basically, Geer starts by roughing his cutting edge to shape with a file, rocking it slightly to form a convex-sided bevel—never a fragile flat or hollow-sided one. He then smooths the roughed-out edge with a power grinder. Finally, he dresses it razor-keen with a fine hand whetstone. He leaves no visible scratches to provide chip-prone weak points in the hard steel. At all chopping events he carries a pocket whetstone for an important reason: Slide it along each side of the cutting edge and if you hear a faint click there's a depression in the thin section, often too small to see. Work it out in a minute or two with the whetstone and your axe is as good as new for the next heat. Neglect it and it not only impedes the cut but grows larger with each stroke.

It takes practice, of course, to learn to use an axe, still more to be a contest

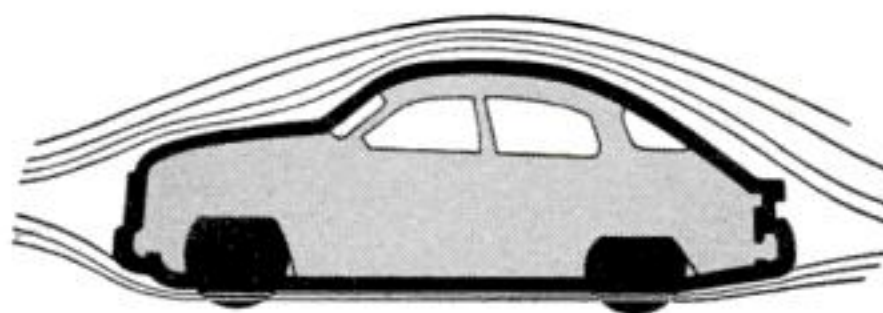
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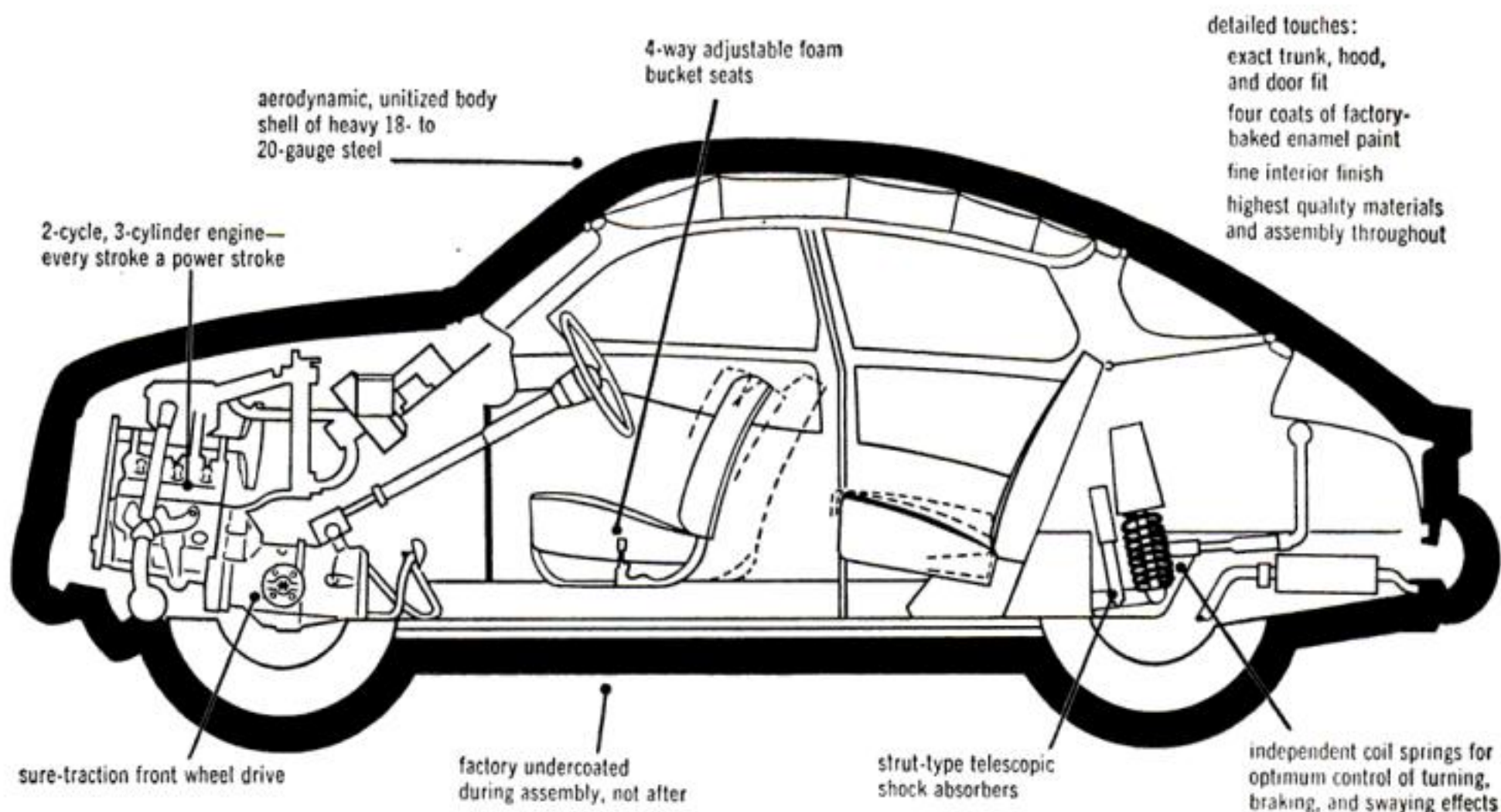


SAAB FRONT WHEEL DRIVE transmits engine torque directly to front wheels. The result is extraordinary directional stability and handling ease under all road conditions, plus outstanding traction around corners, over icy, wet, or muddy patches, and snow. Front wheel drive and carefully calculated understeering provide best possible high speed roadability and safety. Other advantages: more comfort (because there is no driveshaft hump) and more trunk and interior space.



SAAB BODY SHELL is designed and wind tunnel tested for best possible aerodynamic efficiency. Full belly pan further reduces wind resistance and subdues road noise. Result: increased economy, better performance, excellent stability—even in cross-winds of gale force. Moreover, body shell is virtually uncrushable, combining 18- to 20-gauge steel (thicker than most American cars) and rigid unitized construction for optimum safety.

that it has a 24,000-mile/24-month written warranty*



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enjoy mechanical excellence, technical uniqueness, and extraordinary craftsmanship.

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*Engine, transmission (3- or 4-speed gear box available), and differential have a written warranty for 2 years or 24,000 miles.



\$1895 P.O.E. (little enough for one of the world's best engineered cars)

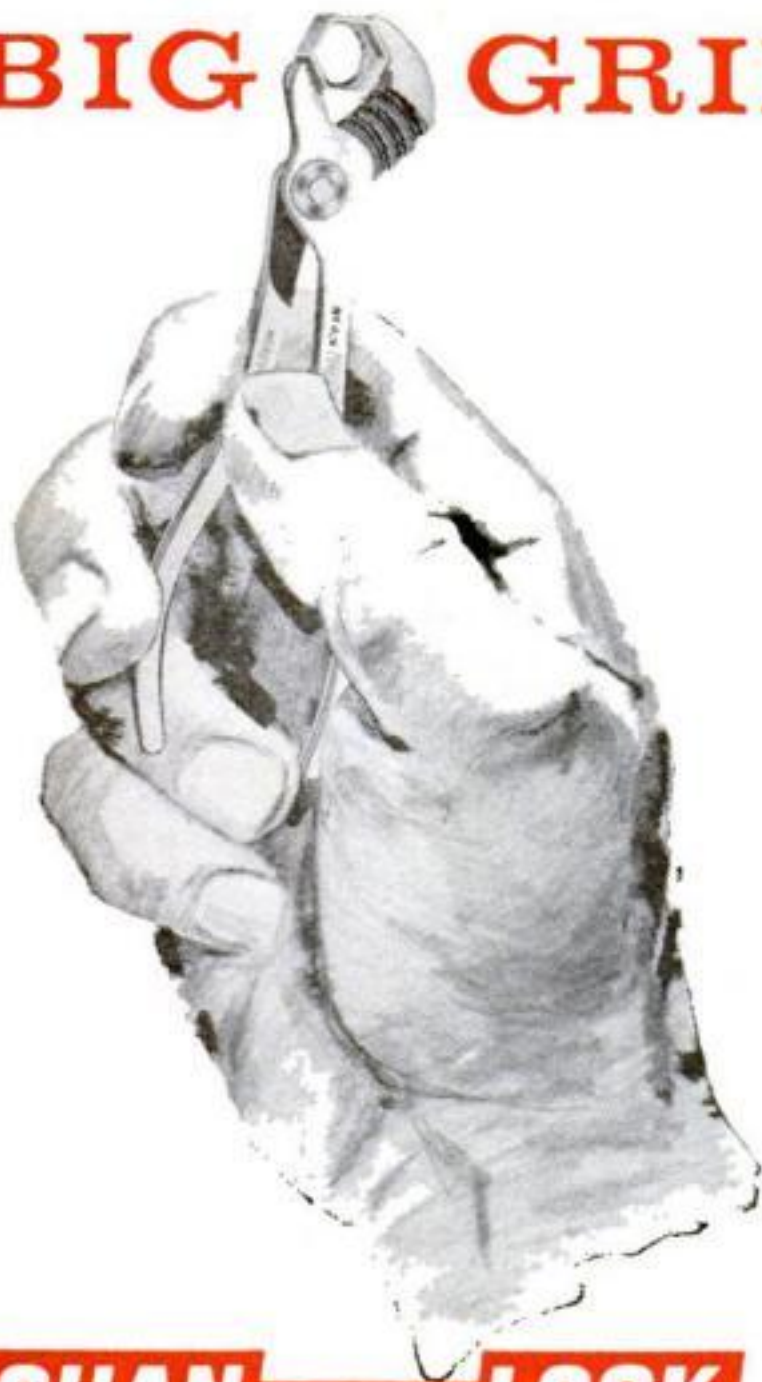
Arrange a test drive at your nearest SAAB dealer. Or write for more information—and the SAAB North American Road Atlas, a 64-page comprehensive travel guide valued at \$1.00, but yours for only 25¢ to cover postage and handling. SAAB Motors, Inc., Dept. 610, 405 Park Avenue, New York, New York.



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How to Chop Like a Champ

winner, and plenty more to hit the championships. Geer, for example, chops better than 500 practice logs a year. But it's a popular sport in all timber country. In Australia, where it got its official start 75 years ago, it has reached baseball proportions. Major chopping events are held in a 65,000-seat stadium where last year's championships packed in a million and a quarter people in eight days.

A champion comes through. If you feel like trying some competition in a country fair wood-chop, don't let people talk you out of it just because you don't look like a lumberjack. You may surprise them, as Geer did some years ago in New Hampshire, when he was pitted against a six-foot, four-inch local champ who carried 275 pounds of solid muscle. This awesome adversary vaulted to the stage in a single panther leap and smashed through a 10-inch alder log in 44 seconds while the crowd went wild. Geer climbed the steps to the stage, ignoring some guffaws and the bellowed comment that the contest was for men, not boys. But he sheared through his matching log in 22 seconds, just half the giant's time, and the fans brought down the house.

With plenty of practice you may win the first contest you enter, as Geer did at 21. If you do, you'll probably never quit. He doesn't plan to. But if you don't win, you can't really lose. Your practice logs will keep you in firewood, and the chips make fine kindling. ■ ■

Aluminum coal car



The gondola above, built entirely of aluminum plate, weighs half as much as a steel car. It enables mine locomotives to pull longer trains. The maker is Irwin-Sensenich Corp., Irwin, Pa.

A PHILIPPINE MAHOGANY 16'x8' WALL ONLY \$19⁹⁸!

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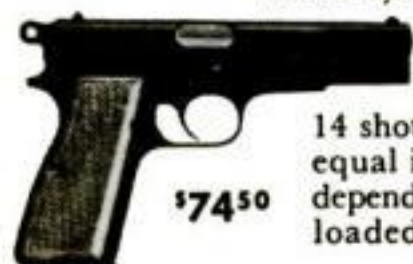
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Alone in the Dark with a Panic Button

[Continued from page 91]

muscle. The ideal: take it all out of fat.

Prof. John E. Christian, head of Pur-
due's Bionucleonics Department, enlist-
ed 45 "healthy obese" grownups in a
rugged experiment. They lived 80 days
on Metrecal, some tea and black coffee.
They slid into the big counter's tight can
to get their fat measured every week.

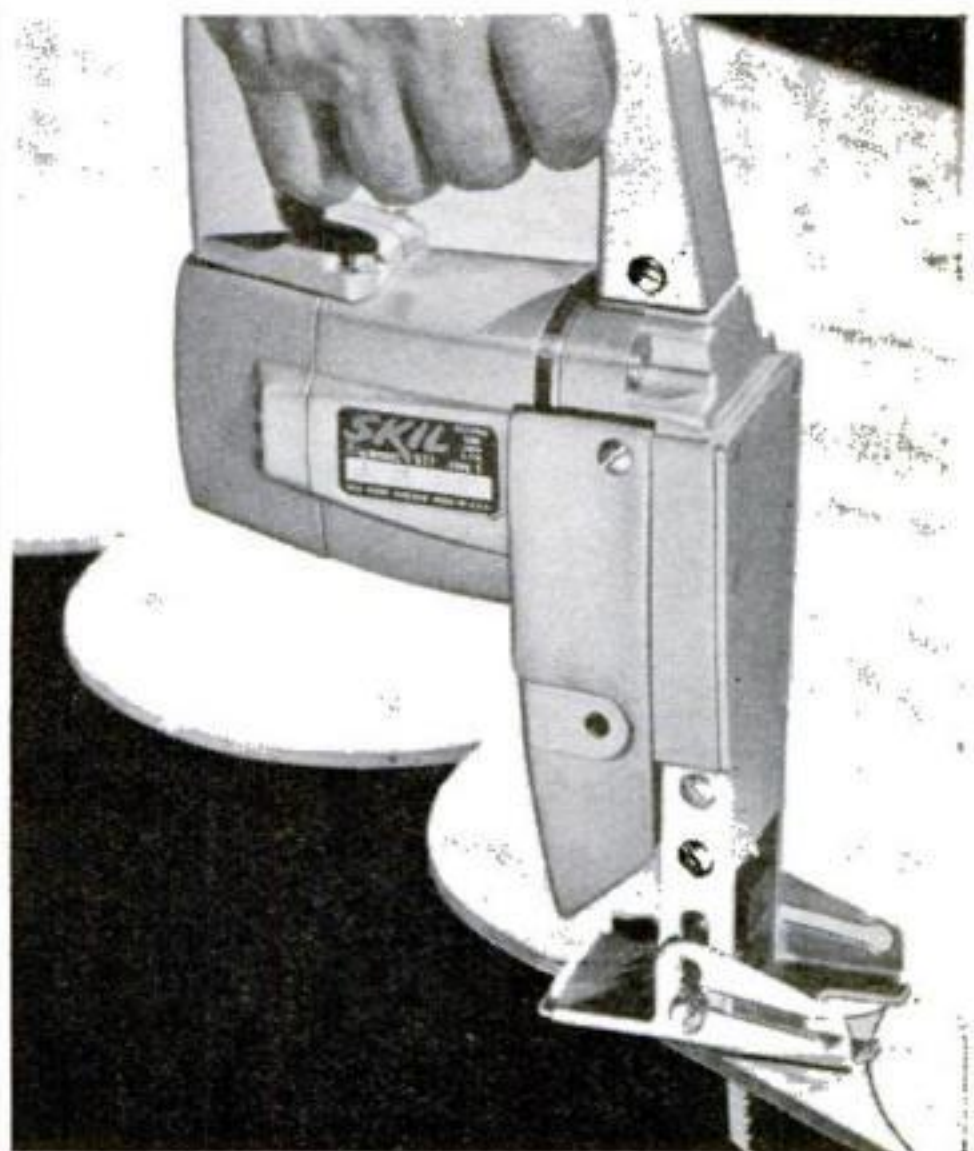
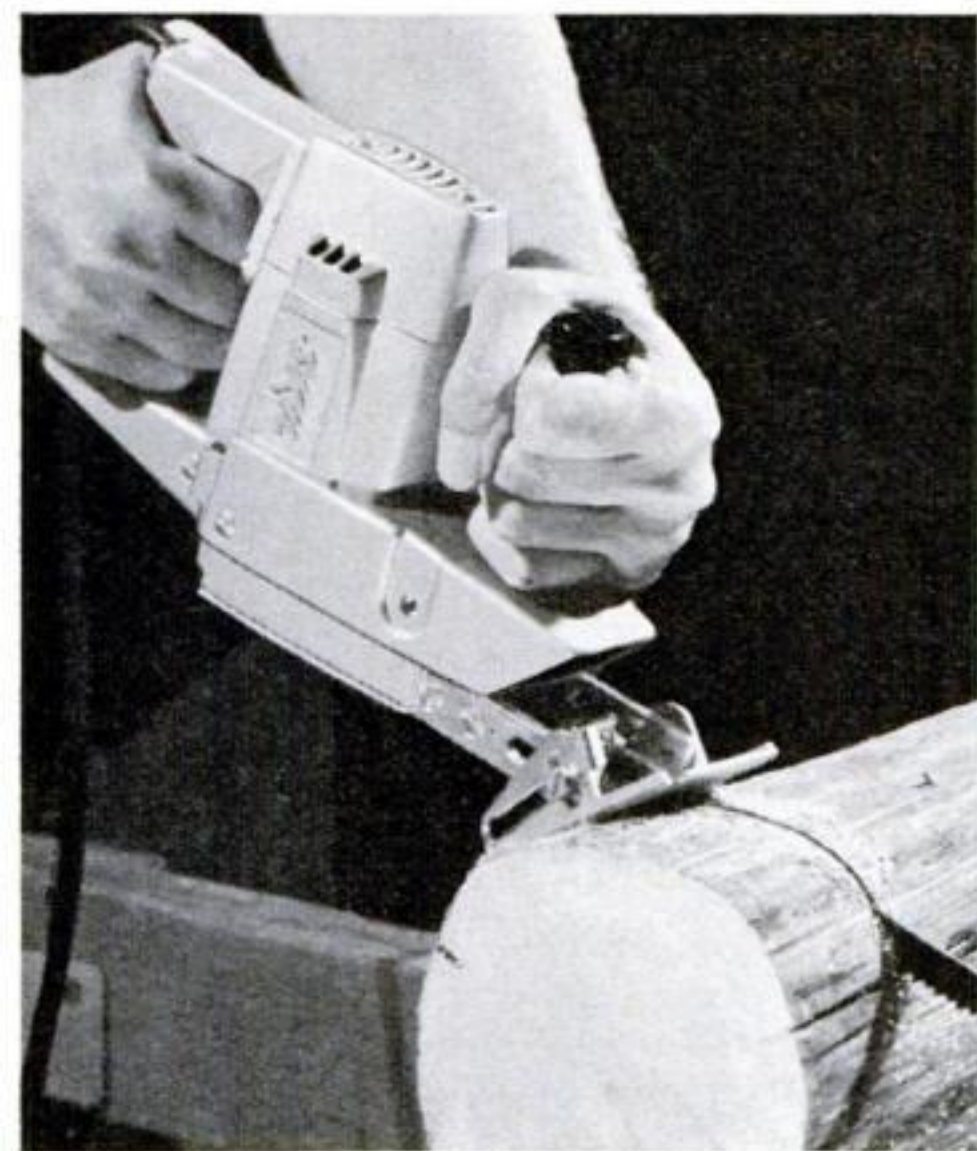
Later, other reducing agents will be
tested the same way. Animals—pigs,
sheep, calves, ducks—are also measured
to check on the value of feed: The feed
that produces the heaviest but leanest
livestock is the most useful. Eventually,
the counter is expected to become a
unique tool for analyzing diseases. It
may locate tumors, unravel the effects
of aging, evaluate results of exercise.

Rating the muscle men. Counting
atomic rays measures fat because your
body contains a fraction of an ounce of
potassium. Almost all of this potas-
sium is concentrated in your muscle,
none in your fat. So measuring your
potassium content gives a quick reading
on your muscle percentage.

Purdue's huge counter does this by
detecting gamma rays. All potassium
contains a very small percentage of ra-
dioactive potassium-40, which throws off
gamma rays of a specific energy at a
known rate. Totting up those particular
gamma rays sent out by a person in one
minute (usually 20,000 to 24,000) gives a
quick reading on his potassium-40 load,
which reveals his total potassium con-
tent, which tells the muscle to fat ratio.

This measurement can't be made by
passing an ordinary Geiger counter
around your body, because you contain
so little potassium. The general "back-
ground" of radiation from dust, building
materials, and cosmic rays drowns out
the few rays from your potassium-40.
That's the reason for the six-inch steel
shield. The counter itself must sur-
round the body and be close to it, and
that explains the tight quarters. The
snug can does not have to be dark—but
it might be even scarier if you could see
how small it was. ■ ■

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Skil Recipro Saw makes any cut from 6" fence posts to fancy patterns!

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sorted accessories
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\$25.50
No. 2 Moto-Tool
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sorted accessories
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Coming Soon: More TV Channels for Everyone *[Continued from page 127]*

Will you have to pay by the hour? Possibly. UHF promises to make pay television practicable. But you'll be getting first-run movies, pre-Broadway shows, and boxing matches and other live sports events for your money. Channel 18 in Hartford, Conn., recently began a test of pay TV using Zenith's Phonevision system. The picture is scrambled at the transmitter and can be unscrambled only by a special device connected to the subscriber's TV set.

How much is an all-channel set? At present, \$20-30 more than a VHF-only model. But mass production, research, and competition should whittle this down. Since UHF tuners need cover only one continuous band, they cost less to make than VHF tuners. Now, with a big stake in UHF, the TV-set makers are sure to pour more research dollars into developing a single-unit all-band tuner.

Can you convert your VHF set for UHF? Yes. An external converter, or UHF tuner, can be installed. This steps down UHF-channel signals to the frequency of channel 5 or 6. This new signal is fed to the VHF antenna terminals. Cost, including antenna coupler and amplifier, is \$16-30.

Also, any step-type VHF tuner can have a special strip circuit inserted for any particular UHF channel. Located at an unused place on the dial, it is, in effect, a single-channel converter. The drawback: If you move, or if another UHF channel is added in your area, you'll need another strip. Each strip costs about \$10-12, including installation. An antenna coupler (about \$2.25) is also needed.

What is the future of UHF? If you're expecting an immediate boom in UHF programs, forget it. It will take time for the all-channel sets to get into general circulation, probably five to seven years before advertisers will support the new stations.

But in anticipation of future rewards, there is sure to be a scramble for UHF permits in the more-desirable areas. Some stations will go on the air in the hope of winning early major-network affiliation.

UHF television has worked in a number of cities besides New York and San Antonio. These include Fort Wayne, South Bend, and Elkhart, Ind.; Wilkes-Barre and Scranton, Pa.; Fresno, Calif.; Yakima, Wash., and more. Your town could be next.

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You have to find the trouble before you can fix it! Most manuals sadly neglect this vital subject—but not GLENN'S. A big 86-page section with dozens of Quick Guide Trouble Shooting Charts helps you locate troubles in any section of a car accurately and in lots less time. First the likely causes for each type of trouble are outlined. Then you learn to pinpoint the actual trouble quickly and surely by professional methods that eliminate lost time and guesswork. Many users say this feature alone is worth the entire price of the manual! Try it and see!

Report on the New Weller Saber Saw

[Continued from page 161]

case, the cutting action comes to a halt, but you may not notice why at first because the movement of the material is so slight that it's practically invisible. Actual jamming of the blade is rare, but when it does happen, the saw simply stops cutting. There aren't any of the violent fireworks that frequently spell the end of a conventional blade.

New blades give finer cuts. You're in for several surprises when you get your first look at the blades that accompany the new Weller. They're half as thick as most conventional blades because their short stroke doesn't require as heavy construction. The result: You can make extremely fine, hairline cuts similar to those of a hand coping saw. Some of the blades are also only $\frac{1}{8}$ " wide from front to back, enabling you to make tight-radius cuts that would cause ordinary blades to bind. In tests, the Weller cut curves down to $\frac{1}{8}$ " radius, not possible with conventional blades.

The new blades are also tilted at a very slight angle to their axis of movement—a clever bit of engineering that, in effect, advances the teeth on the cutting stroke and retracts them on the return stroke. The purpose here is to reduce friction when the teeth aren't cutting and let chips fall clear of the work.

And here's a real sleeper: Conventional saber blades have upward-pointing teeth that cut only on the upstroke. While this has certain merits, it does put the rough side of the cut on *top* of your work. To avoid marring the face, you must thus saw from the back. Often this isn't convenient, so Weller has thoughtfully provided extra blades that have *downward-pointing* teeth. These cut on the downstroke, allowing you to make smooth, chipfree cuts on the face of delicate materials such as wood veneers and plastic laminates.

What the saw won't do. The Weller is primarily intended for fine cutting of relatively thin materials. It won't chomp through a two-by-four. Maximum cutting depth is $1\frac{1}{4}$ ", compared with the 2" or more of most conventional saber saws.

So far, the only blades available are for use in wood and soft materials. Metal cutting, at least for the present, isn't recommended. All of the blades have very fine teeth—14 to the inch—and are designed for smooth cutting rather than fast cutting. For

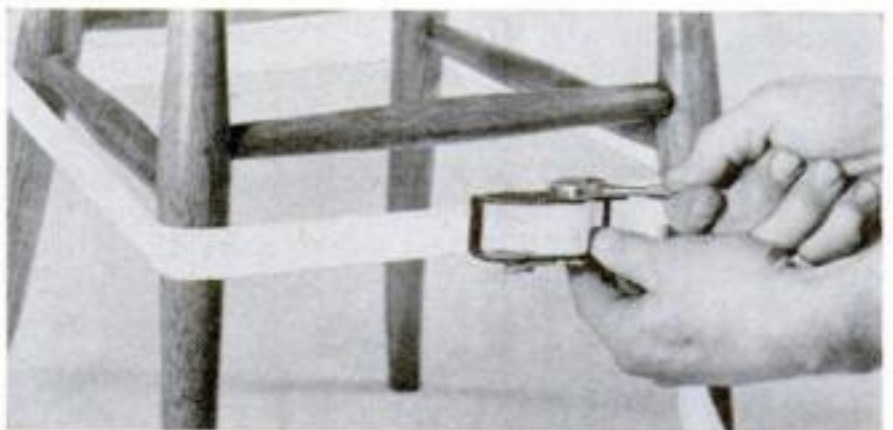
this reason, you can't expect the saw to be a speed demon on heavier materials, as the test results show.

One minor annoyance: The base plate is held to the housing by four screws whose heads protrude beyond the side of the plate. This makes it difficult to slide the saw along a clamped guide strip for long, straight cuts. Locating the screws elsewhere or recessing their heads would have been better.

On the plus side, you get several extra benefits. The short blade stroke doesn't spit sawdust into your eyes as you peer in closely to follow an intricate pattern. The downward-cutting blades pile up less sawdust on the work, making your guideline easier to see.

The blade-holding arrangement, a slotted chuck squeezed tight by a single hex nut, is one of the slickest we've seen. You simply loosen the nut a quarter turn, slip in a blade, and give the nut another quarter turn to lock the blade in. There are no clamp screws to become jammed. The entire housing, except for the metal base plate, is made of insulated plastic, giving you protection against shocks.

All in all, we found the new Model 88 Weller to be a fine saw for the precision craftsman where heavy cutting and hack-sawing aren't required. A significant part of the news is also its price—\$22.95—making it, in our opinion, an excellent tool buy. It's sold by Weller Electric Corp., 601 Stone's Crossing Rd., Easton, Pa. ■ ■



Flexible gluing clamp fits any shape

Odd-shaped objects that are hard to clamp, such as chair legs, can be pulled up tight with this adjustable tape. A ratchet-action tightener enables you to apply heavy pressure, while the soft material prevents marring. Norfolk Products Corp., Norfolk, Conn., sells the 12' tape for \$4.95. Extra tapes in longer lengths are also available.

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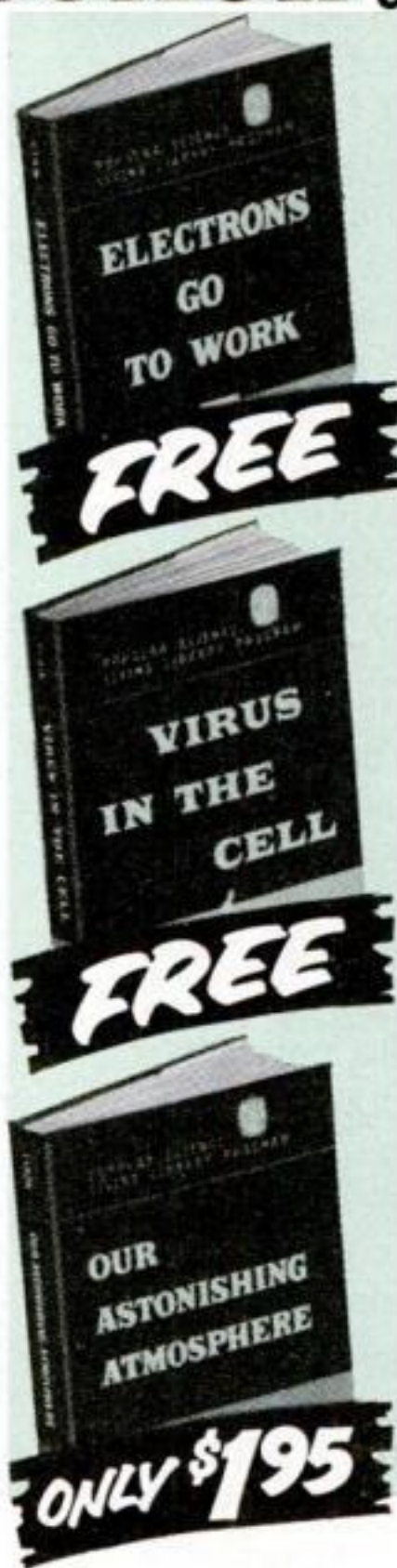
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minimum back pressure. Most impressive in the deep-breathing department is the pair of oversize, downdraft carburetors. Mounted directly on the cylinders, each carb has a throat diameter of just over one inch, providing hefty gulps for such a small engine.

Low friction. The engine's lower end abounds in bearings. Connecting-rod big ends turn on needle bearings. The built-up crankshaft runs in both roller and ball bearings. An oil pump—driven by a gear on the crankshaft—lubricates the transmission, cylinder head, and crankshaft-plus-connecting-rod bearings through three separate lines. The wet-sump system eliminates a bulky oil-storage tank and provides an oil bath for the clutch and primary drive chain.

A ride on the Honda CB-77, nicknamed the Super Hawk, confirms that it's a willing goer. I borrowed a new one from Ghost Motorcycle Sales Corp. of Port Washington, N.Y., and rode it 100 miles over varied roads.

The greatest delight, besides the electric starter, was the smoothness of the engine at low speeds. You'd expect a small engine with high r.p.m.s, high compression, outsize carburetion, and sporty valving to be rough, but it wasn't. Honda smoothed out the power strokes by setting the connecting-rod throws 180 degrees apart. The main moving parts of the engine are in balance.

Since my borrowed Super Hawk had less than the recommended 500 miles on the clock, I didn't wring it out. Even so, acceleration was snappy, top speed well over turnpike limits, and flexibility admirable. At high revs the engine wasn't the shrill buzz box I had expected. At normal speeds of 40 to 50 m.p.h. the tach needle seldom reached 5,000 r.p.m.

This flexibility is good news for riders who would rather not have to shift gears at every turn in the road. It's particularly good news to big-footed Americans who may find the gearshift lever too small and the gear changes somewhat uncertain. While we're complaining

about things, the kick starter gets in the way of that other big foot when it's pushing down on the rear brake pedal. Otherwise, there's little to gripe about.

Honda did not restrict his meticulous attention to the engine, I discovered. To keep the machine's dry weight down to 350 pounds, he devised a backbone-type frame of high-carbon-steel tubes. Instead of running frame members from the steering head down under the engine, to cradle it, he left a hole into which the engine fits; the engine thus forms a structural part of the frame. Suspension is by telescopic forks forward and swinging arm aft, both units having coil springs with oil damping.

Electricity for the coil ignition and the lights is supplied by an alternator keyed to one end of the crankshaft. The AC is converted to DC by a selenium rectifier and fed into a 12-volt battery. If the 10-ampere/hour battery goes dead—as it easily could with a starter that draws from 10 to 50 amps—the kick starter turns over the alternator fast enough to juice the spark plugs.

Brakes are oversize to begin with. Instead of pairing a leading shoe and a trailing shoe, as most production machines do, Honda uses two leading shoes on both brakes. Leading shoes grip the brake drum more powerfully because the whirling drum tends to give a self-energizing effect.

I saw many thoughtful touches you usually find only on costlier machines: a front-fork lock, neutral-indicator light, tachometer, finger-adjustable clutch and brake cables, control buttons built into the handlebar grips, an adjustable steering damper, three-way adjustable footrests, an ignition lock, dual saddle, and adjustable springing to match load.

Surprisingly, all these goodies can be had for \$665 f.o.b. Los Angeles. Not content with being the world's largest maker of two-wheeled vehicles, Soichiro Honda is now working on a small car. If it's like its brothers, it'll be a bundle of slick tricks. ■ ■



START



ONE MINUTE



TWO MINUTES



FOUR MINUTES

Stopwatch-timed photos show progress of painting race between TV twins, Cynthia and Julia Lacy. Using an IMMIE high-speed "glide-on" applicator, Cynthia scores a dramatic victory over her identical twin.

Painting Race Between Twins Proves New Type Brush "Twice as Fast"

Revolutionary New "Glide-On" Brush Does Painting Jobs Easier, Better, and in Half the Time!



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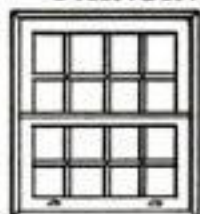
Whether you're painting a chair or a ceiling, an IMMIE brush doesn't spatter. Virtually drip-proof, too! To make it drip, you have to make it take up an excess of paint.



**PAINTS ROUGH AND
IRREGULAR SURFACES**

With an air-foam cushion under its angora bristles, the IMMIE's painting surface contours to fit into every hollow and crevice of whatever you are painting — even deep-grooved shingles.

**APPROXIMATE
PAINTING TIME**



WINDOW 25 minutes instead of one hour



Panel Door 12 minutes instead of 26 minutes



CHAIR 10 minutes instead of 47 minutes.

By PERRY SCHOFIELD
I've just seen an astonishing demonstration of a totally new kind of paint applicator. In a dramatic race between TV's identical Lacy Twins, I saw one of them paint 50 square feet of clapboard siding — without a single spatter or drip — in just 4 minutes by stopwatch. She glided the paint on smoothly and with almost no effort, while her identical twin — streaking and dripping in a frantic struggle to keep up — wasn't able to cover even half the area.

Astonishing New Invention

The winning twin's secret was a revolutionary new-type painting invention called an IMMIE. Unlike conventional paint brushes which require frequent dips in the paint and a lot of tiring back-and-forth wrist action, the IMMIE virtually "floats" the paint on with a single continuous stroke. And it needs to be dipped only about one-third as often.

This is because the IMMIE has at least ten times as many bristle ends that spread the paint with incredible ease and speed. I could hardly believe my eyes when I tried it myself. I painted a strip 6½ inches wide and 5 feet long in just 3½ seconds. Imagine it — 390 square inches in 3½ seconds! And there were no skips, no streaks, no brush marks — none of it had to be gone over!

One-third As Many Dips In The Paint

What amazed me most was the immense area that could be covered with a single dip in the paint — about three times as much as with a conventional brush. This is because the IMMIE is scientifically designed to spread practically ALL the paint it picks up — doesn't hold most of it back in the bristles as conventional brushes are inclined to do.

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try them now and tell your friends, we are offering you this set at the special price of only \$5.98. Yet IMMIES give you genuine Angora bristles — not nylon, horse hair or pig bristles.

Money Back If Not Thrilled

When you receive your set of IMMIE brushes, test them on every kind of paint job you can, even with shellac, varnish and lacquer. If you aren't thrilled — if you don't find they do better work and paint at least twice as fast as conventional brushes — then SEND THEM BACK DIRTY any time within sixty days and we'll refund your money in full. Don't wait. Mail coupon now!

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to Home Owners*

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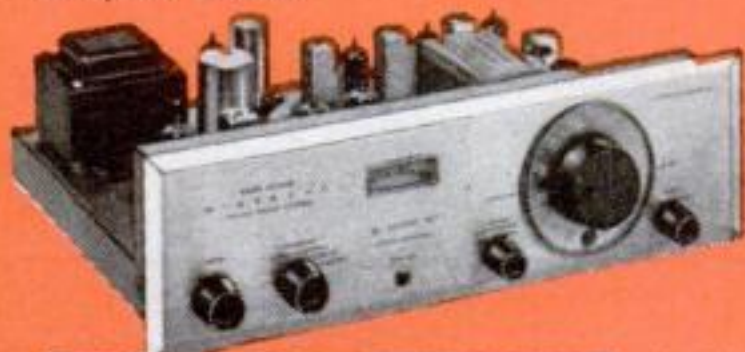
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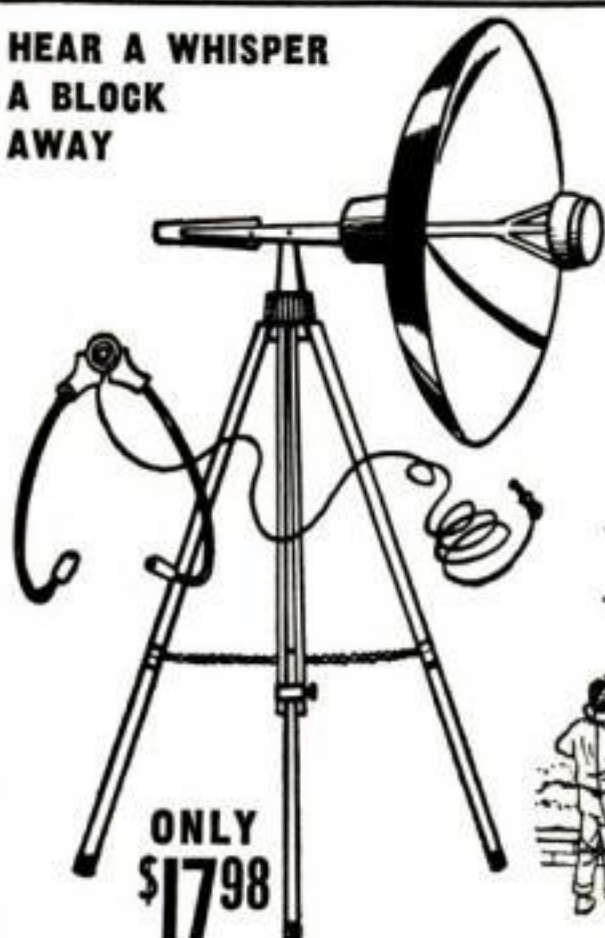
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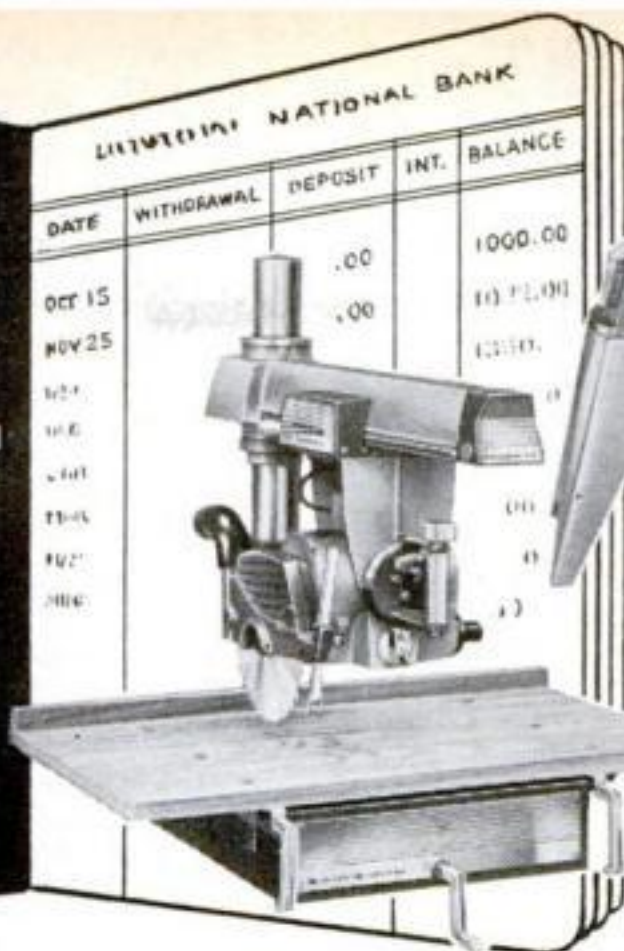
Cantaloupes grow better and faster in the winter when covered by these continuous polyethylene shelters, experiments conducted by the University of California show. Early in the season, melons are two to four times larger than those under old-style paper caps.



Model A planter

A traffic-stopping ad for the Katie Holmes dress shop in Rye, N. Y., is this 1930 Model A Ford equipped with new engine, whitewalls, red upholstery—and a box of imitation flowers. The plastic plants vary with the seasons.

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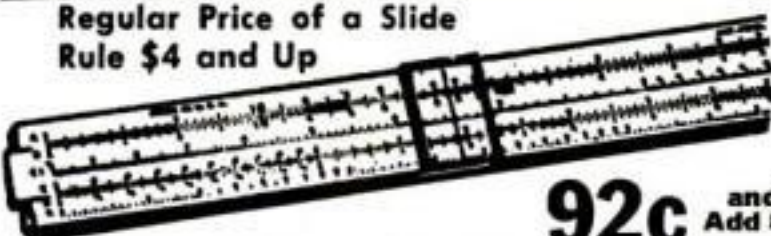
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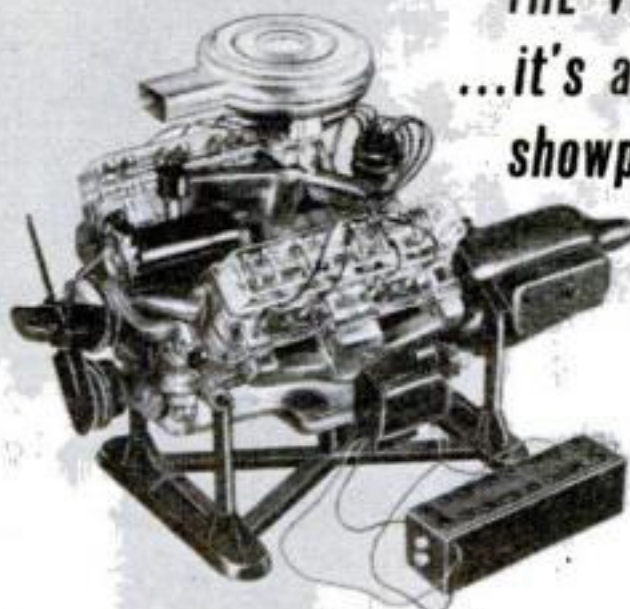
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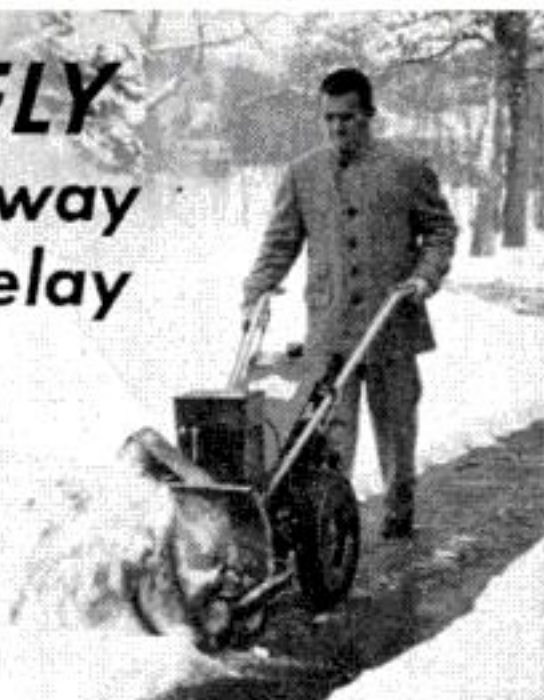
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I Restored an Antique Phonograph

[Continued from page 148]

top and weighted it for a week with scrap iron. When uncovered, the rippled veneer lay flat.

I applied a varnish remover to the outside of the top and to the body of the cabinet, and rubbed off the old cracked coating of varnish. After careful sanding, the beautiful grain of the old oak became apparent. Two coats of paste wax (applied 24 hours apart, buffing after each) accented the grain and left an antique, dull-sheen, hand-rubbed effect.

The two brass hinges were shined bright and lacquered, and the top replaced.

After cutting my new grille from three-ply oak, I sanded the front surface and applied oak stain and wax to match the natural oak of the cabinet. On the rear of the grille went a coat of glue. While it dried tacky, I stretched an oversize piece of antique-looking grille cloth fairly tight, smoothing it face up on a table top. The two were then mated, with the tacky side of the wooden grille against the cloth, and weighted with a sheet of plate glass. After the glue had set, I trimmed away the excess cloth, and inserted the new grille panel into existing cabinet slots.

Coming down the home stretch now, I bolted the whole motor assembly into place and hung the amplifying horn on a new wax cord. This allows it to follow the movement of the head across the record with as little friction as possible.

Would it play? I hesitantly released the governor brake and leaned in, waiting to hear a whisper from the past. I was jolted back by a blast of band music. What it lacked in fidelity—by current standards, there's a serious lack of bass response—it made up in volume. I've shared many a nostalgic evening with friends, since, listening to old songs and comic monologues that delighted a less-critical age. Or *was* it? I'll take my collection of wax cylinders over much of today's popular music!

There are hundreds of original cylinder records still available for a dollar or less each. You can get a list of these for 50 cents from A. Nugent Jr., Antiques, 3804 Charles City Road, Richmond 31, Va. This is a headquarters for collectors or restorers of old phonographs, and it may be a source of missing parts and authentic decals for the set *you* might dig out of that attic. ■ ■

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A New Corvette Bows In

[Continued from page 68]

360. But there all comparisons end.

The frame is heavier. Steel stiffeners lace together inside the plastic body panels. The rear wheels, like the front ones, are now independently suspended. A unique differential housing is attached to the frame. Two universal joints on each side of it sop up jounce. (See story below.) To give the rear wheels added bite, they carry more of the car's weight than the front ones.

The headlights retract. Doors hide them in daytime. At night the press of a switch exposes them. The steering wheel is adjustable by three inches fore and aft. Not instantly, though. It takes a wrench. The same wrench can be used to change the overall steering ratio from a normal 19.6:1 (21:1 in 1962) to 17:1.

The Corvette is a mite smaller. The wheelbase is 98 inches, down 4 from 1962, and the overall length 175.2, down 1.5.

Corvette's new rear axle

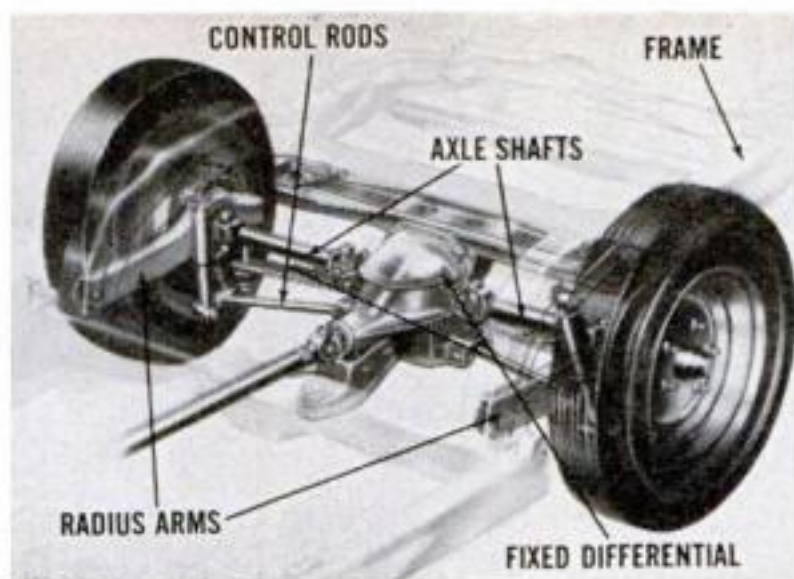
For 1963, Corvette engineers had a problem. They wanted the riding qualities that independently suspended rear wheels would give but, more importantly, the rear-wheel control that a solid axle housing destroys when one wheel hits a bump or pot hole.

But independent suspension in a competition car, slewing around corners? True, the rear wheels of some European competition cars were independently sprung, but their springs were far stiffer to take the side loads.

The engineers wanted not only a better ride and improved handling, but less unsprung weight and an elimination of wheel tramp as well. For rear-wheel control, the wheels would have to move almost straight up-and-down on jounce and rebound. For that reason, notwithstanding the beauty of its engineering, the Corvair's system of swing axles [PS, Oct. '59, p. 108] would not do. The wheel camber altered too much with jounce, and particularly with jounce augmented by side loads.

How did they solve the problem?

A New Corvette Bows In



Four axle universals transmit Corvette's power.

They use what they call a three-link system. Its components: a radius arm running longitudinally from trunnion at the car frame rearward to the wheel spindle support; a lateral control rod anchored to the differential and wheel spindle; a double universal tubular axle.

The differential housing is anchored to the frame to make it part of the car's sprung weight. With no room for longitudinal leaf springs, the engineers adopted a single, transverse, nine-leaf spring. At center it is bolted to the differential and, therefore, to the frame. Floating rods connect the spring's main leaf to the radius arms. That relieves the spring of any forces except vertical suspension loads, lending it as much fore-aft rigidity as paired leaf springs.

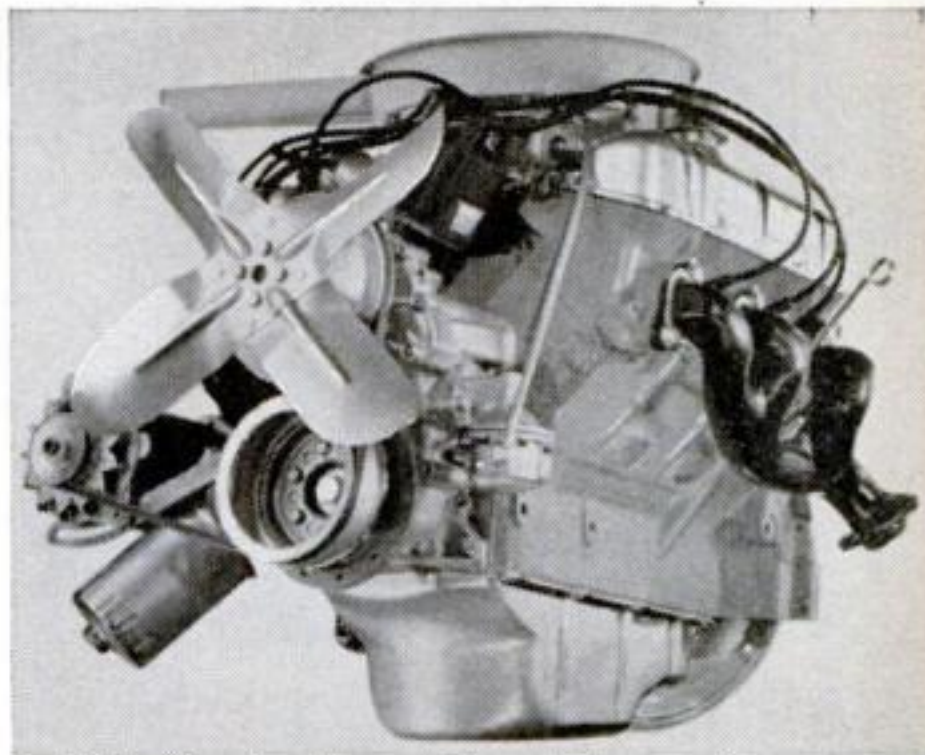
The differential becomes the key to acceleration and braking forces and the absorption of side loads. Radius arms, axles, and control rods transmit these to the differential and thence to the frame.

Axle shafts and control rods work like the suspension system used on front ends to retain the proper wheel camber angle on jounce and rebound. Rear-wheel motion is practically vertical. ■ ■



Reversible motors operate headlamps. Dash light warns if lights are on with doors closed.

QUICK QUIZ BY QUAKER STATE



1. What is significant about this motor?



2. What does this symbol stand for?

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Ford Stable: A Clashfree, 3-Speed Box

[Continued from page 75]

regulator, generator, or both. A bimetal automatic control dumps hot air from the carburetor to prevent vapor lock when the engine is turned off. Another automatic control retards the return spring on the throttle linkage to stop engine stall-out during hard stops.

The Fairlane, in common with all Ford Motor's cars, retains those rear "Thunderbird-roof" supports—inelegantly called ear muffs—that shut off part of a driver's rear view. They must have appeal, though—almost every other car in the industry has copied them.

Thunderbird

The T-Bird introduces an astronomical lubrication figure: After factory greasing, the front suspension is good for 100,000 miles, or seven years, whichever comes first.

Ford tried for two years to achieve this almost-permanent lubrication. Rain kept washing out the grease. If it didn't wash out, the stuff froze. Ford and the oil industry finally got the combination—molybdenum disulphite combined with lithium. Among other properties it had to have was chemical stability.

The 100,000-mile lube covers upper and lower ball joints, tie-rod joints, and steering geometry. Transmission oil and differential grease are already a life-of-the-car deal. And who remembers when he last had rear leaf springs greased?

The T-Bird's windshield wipers are hydraulically powered by tapping fluid in the power-steering unit to run a pump motor. It keeps the blades going in high winds, at high speeds, when electrics and vacuum-powered ones tend to balk.

An alternator replaces the generator. The exhaust pipe is double-walled to deaden sound.

In the next two months the T-Bird will have a transistor ignition system.

Grille, tail lights, and wheel covers are new. A sharp eye will detect also a change in the front fenders, doors, and sheet-metal sculpturing. ■ ■

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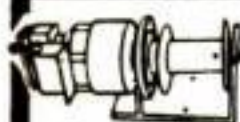
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New Engines: Chevy, Tempest

[Continued from page 79]

has a big bore, short stroke for high mechanical efficiency. The thermal efficiency nonetheless remains good, due in part to head design but mostly to today's superior fuels.

For what it may portend for the future, the big news is the engine's seven main bearings. Practically a twin of the 120-horsepower six brought out last year to power the Chevy II, the new engine can grow still more.

On the basis of today's sales ratios, the engine will power a little better than one out of every three standard Chevrolet cars produced during the 1963 model year. If its basic design is as good as that of the 1929 engine, Chevy won't have to junk it until 1985.

Tempest V-8. The reason for the new Tempest engine is simple. The car was engineered and styled for younger motorists. Younger motorists want performance. The standard four-banger engine left something to be desired when the light turned green.

The 185-horsepower aluminum V-8 that had been borrowed from Buick for the Tempest had proved too costly for the customers.

So, for the same reason that Buick brought out its less costly cast-iron V-6 last year, Pontiac brought out its less costly cast-iron V-8 this year.

To describe the Tempest's new 326-inch, 260-horsepower engine as brand-new is a slight abuse of the truth. Actually, it is the standard Pontiac 389-inch, 348-horsepower block with a bore so much smaller that it is undersquare. The bore is 3.72 inches against the bigger engine's 4.06. The stroke for both is 3.75.

It also would abuse the truth to say that a smaller bore is the only change. Cylinder heads are new. So are the oil rings, pan, and exhaust manifold. The added torque of the new engine—352 pound-feet against 230 for the aluminum V-8—necessitated a heftier clutch ahead of the manual transmission, bigger components in the automatic, and heavier gearing in the drive train. ■ ■

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[Continued from page 77]

bumper to bumper. The Imperial received only a face lift.

As was reported in last month's Detroit Report, the Dodge Lancer grew 7.1 inches and took on the Dart nameplate. The Valiant has been stretched 2.2 inches, the Plymouth 3 inches, and the Dodge 6.2 inches. Only the Chrysler New Yorker has shrunk; it's 4 inches shorter.

Good news for fresh-air fans: Valiant and Dart are available as convertibles.

Engines: a wide range. Valiant and Dart retain last year's 170- and 225-inch slant-six engines. In the Plymouth and Dodge (except Polara 500) the 225-inch six and 318-inch V-8 are standard. The 383-inch V-8 with two-barrel carb is standard on the Polara 500, and a four-barrel version is optional. The power-pack 318 with its four-barrel and hot camshaft is no longer available on the Dodge. Neither is the 361-inch V-8. The competition-only 413-inch engines (410-440 hp.) are still available on Plymouth and Dodge.

The Chrysler 340- and 380-hp. engines have now been replaced by a 360-hp. version. Still available is the 361-incher on the Newport and 383-incher on the 300. The 300J engine will be more powerful. The car will be introduced in November. Imperial's 340-hp. 413 remains basically unchanged.

A number of engine accessories, including carburetors, starters, alternators, and exhaust-system components, have been improved throughout the Chrysler line.

On the Dodge Dart 170-inch engine a spring-staged choke improves starting at low temperatures. The improvement reduces the choke blade closing torque at temperatures below zero.

Improved windshield wipers and rust-proof chrome-trim fasteners are used on all the new Chrysler cars. An interesting addition to the Imperial is a vacuum-operated parking brake that disengages automatically when the engine is started and the transmission put in gear. ■ ■



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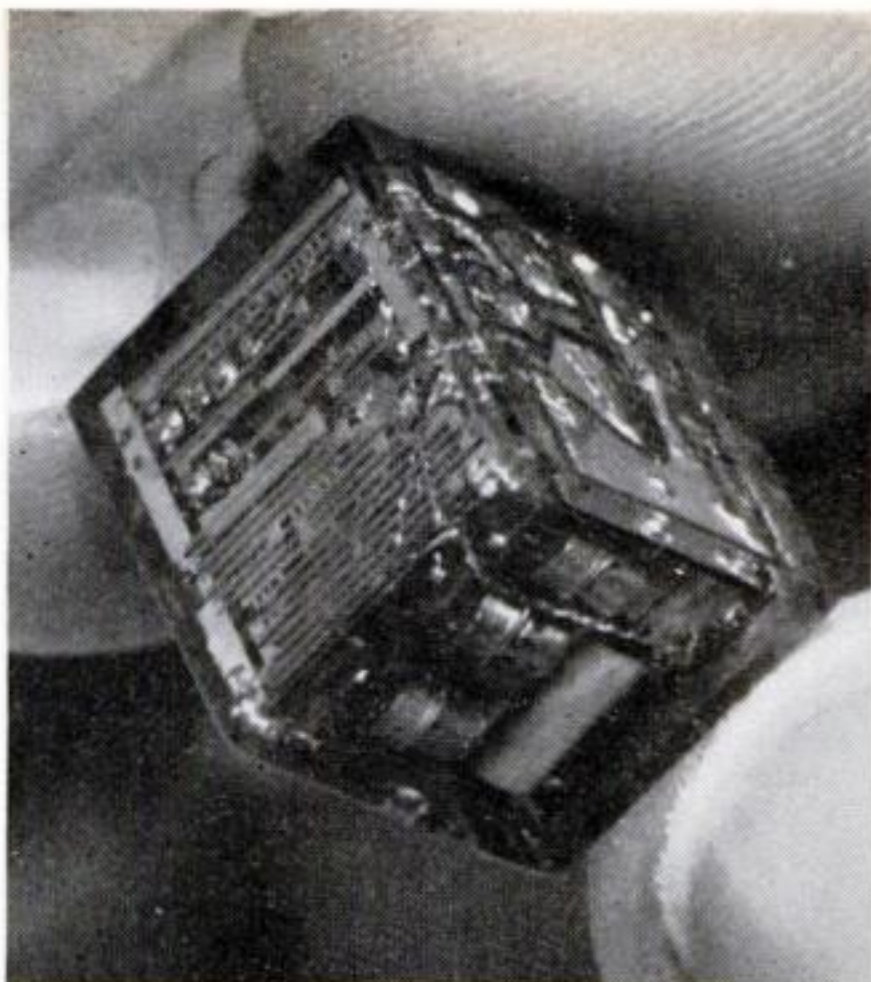
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Taipei, the "big city" of Formosa, has become considerably closer for rural families such as this one, now that a small bicycle engine has been introduced by a local manufacturer. The motor bike is a sign of the new mechanization sweeping the island, even though the traditional pedicab is still in evidence.

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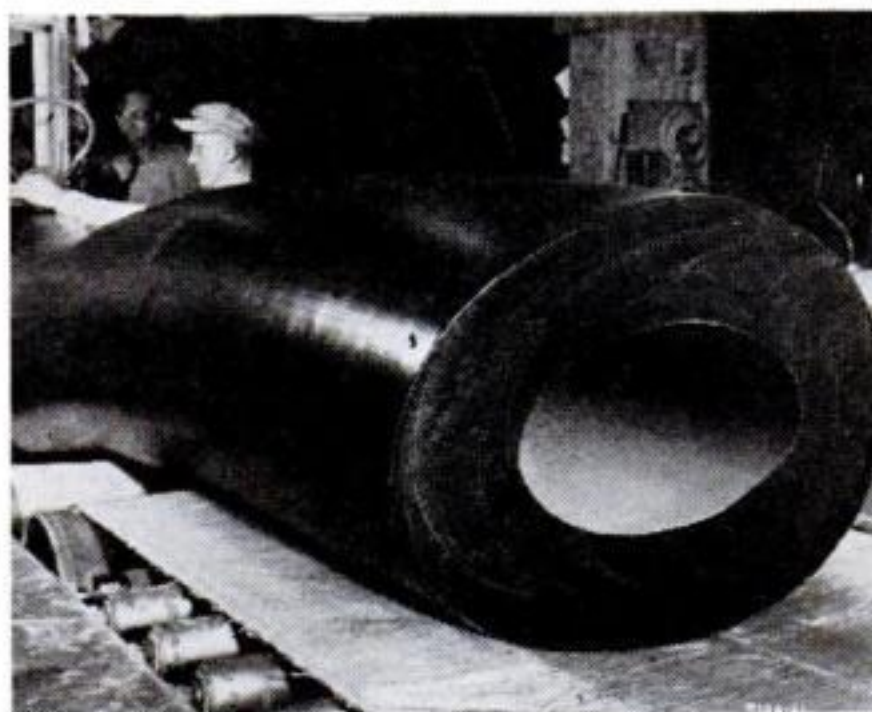
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USE THIS HANDY INDEX TO FIND WHAT YOU WANT

Advertising, Agencies for Advertisers . . .	53
Agents Wanted . . .	43
Art Instruction, Cartooning, Sign Painting . . .	54
Authors Service . . .	52
Auto Supplies & Equipment . . .	2
Auto Trailers . . .	3
Automobiles & Midget Cars . . .	1
Aviation . . .	5
Batteries, Generators, Etc. . .	6
Boats, Outboard Motors . . .	11
Body-Building Courses, Jiu Jitsu, Etc. . .	12
Books & Magazines . . .	23
Business Opportunities . . .	37
Business Service, Information, Name Lists . . .	50
Buy It Wholesale . . .	38A
Cameras, Photo Supplies . . .	34
Camping Equipment & Tents . . .	16
Christmas Gifts . . .	A1
Coins & Currency . . .	26
Contests . . .	46
Detectives . . .	47
Diving Equipment & Training . . .	15A
Do-It-Yourself . . .	66
Dogs, Birds, Hamsters, Rabbits & Pets . .	17
Earthworms, Crickets, Frogs . . .	18
Educational & Instruction . . .	45
Electrical Supplies & Equipment . . .	7
Electric Trains . . .	64B
Employment Information . . .	42
Engineering Services . . .	60A
Engineering Supplies & Equipment . . .	9D
Engines, Motors, Etc. . .	10
Farms, Other Real Estate . . .	19
Field Glasses, Telescopes . . .	14
Foods . . .	71A
For Inventors . . .	60
For Sale Miscellaneous . . .	71
For the Home . . .	69
Formulas, Plans, Etc. . .	39
Government Surplus . . .	11A
High-grade Salesmen . . .	44
Hobbies, Collections . . .	31
Home Craftsman . . .	65
Hypnotism . . .	24
Import-Export . . .	38B
Inventions Wanted . . .	61
Jokes, Games, Novelties, Etc. . .	24A
Language Outfits . . .	48
Loans By Mail . . .	80B
Magic Tricks, Puzzles, Etc. . .	25
Mathematics . . .	41A
Minerals & Precious Stones . . .	30
Miscellaneous . . .	79
Models, Model Supplies . . .	64
Moneymaking Opportunities . . .	38
Motion Pictures & Color Slides . . .	33
Motorcycles, Bicycles & Supplies . . .	4
Musical Instruments and Song Writers . .	35
Of Interest To Women . . .	70
Old Gold, Jewelry, Watches, Etc. . .	67
Personal . . .	80
Phonograph Records . . .	35A
Photo Finishing, Photocopies, Etc. . .	32
Plastics . . .	40
Printing, Multigraphing, Etc. . .	57
Printing Outfits, Supplies . . .	58
Profitable Occupations . . .	22
Radio, TV, Electronics, Hi-Fi . . .	36
Remailing Service . . .	80A
Rubber Stamps & Office Supplies . . .	56
Science & Chemistry . . .	41
Special Services . . .	51
Sporting Goods, Guns, Fishing Tackle, Etc. . .	15
Stamp Collecting . . .	28
Surveying Instruments . . .	9B
Taxidermy . . .	13
Tobacco & Pipes . . .	68
Treasure Finders & Geiger Counters . .	77
Trees, Shrubs, Roots & Herbs . . .	20
Typewriters & Office Machines . . .	55
Wanted to Buy . . .	72
Watch Repairing . . .	78
Wearing Apparel . . .	73
Welding, Soldering . . .	8

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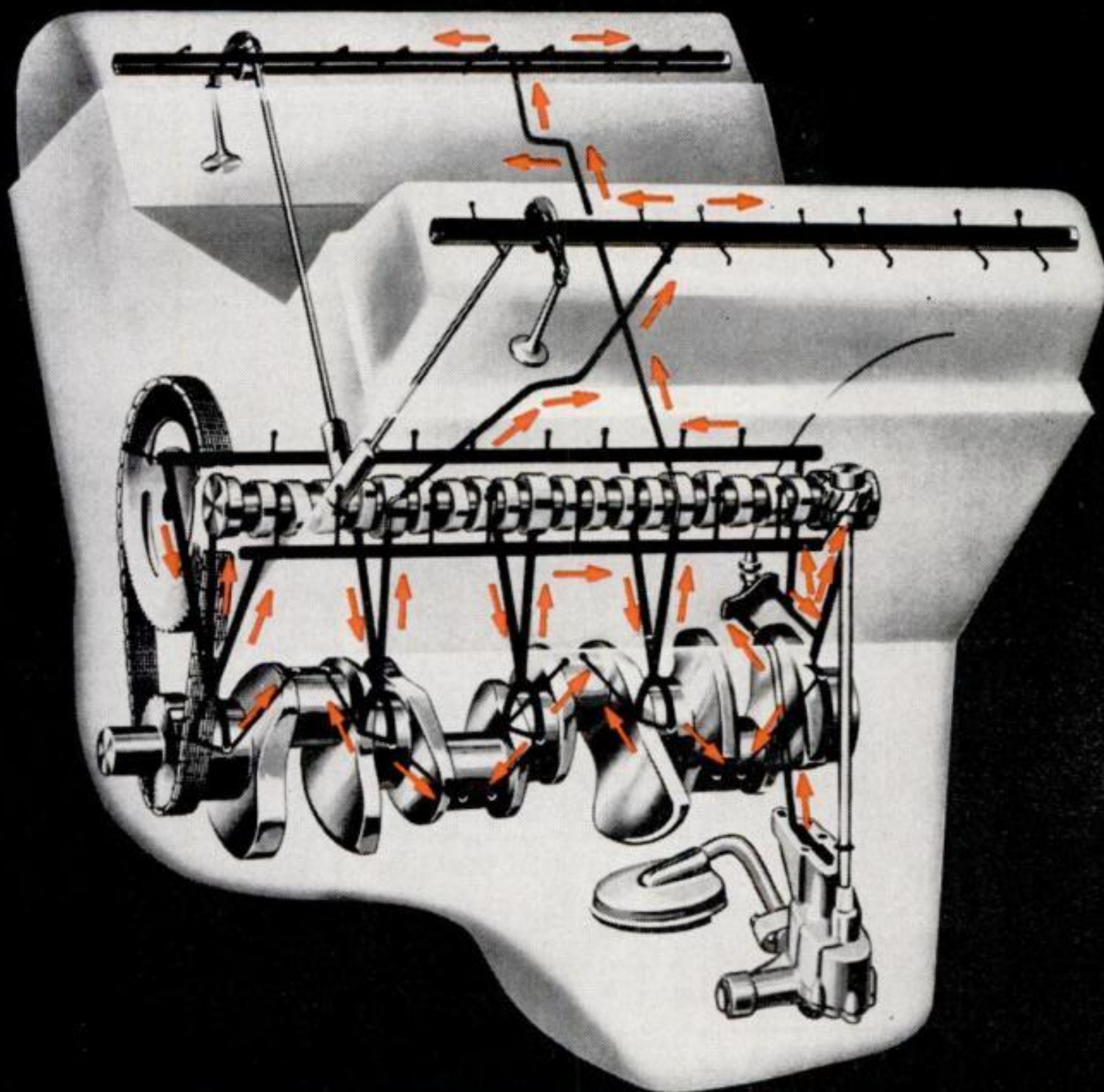
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2. Entries must be postmarked by November 9, 1962 and received by November 16, 1962. Send in as many entries as you wish. Each entry must be mailed separately.

3. Each entry must be accompanied by any of the following: three empty CHESTERFIELD KING wrappers, or an end panel from a carton of CHESTERFIELD KING, or three pieces of paper, 3" x 5", on which you have hand-copied the words "CHESTERFIELD KING" in block lettering from any source.

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